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IN JAPAN

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THE COMMITTEE ON PACIFIC OCEANOGRAPHY
OF
THE NATIONAL RESEARCH COUNCIL OF JAPAN

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TOKYO, 1939

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Bopyrids from Kyûsyû and Ryûkyû*

By

Sueo M. Shiino

Zoological Institute, Kyoto Imperial University

(With 13 Text-figures)

Through the kindness of Mr. Sadayosi Miyake of the Zoological Institute, Kyûsyû Imperial University, a good collection of Bopyrid Isopods made in Kyûsyû and Ryûkyû was recently submitted for my examination. It consists of the materials gathered by himself and those deposited in the Museum of that Institute and comprises 11 species, 4 of which are new to science and one represents a new genus. The following is the list of species.

Apopenaeon japonicum (Thielemann)
Parapenaeon consolidata var. *richardsonae* Shiino
Pseudione petrolistheae Shiino
Aporobopyrus ryûkyûensis n. sp.
Aporobopyrus parvus n. sp.
Metabopyrus ovalis n. gen. & n. sp.
Bopyrella crenulata n. sp.
Bopyrina amakusaensis n. sp.
Portunicepon goetici Shiino
Apocepon pulcher Nz. & B. à B.
Athelges takanoshimensis Ishii

In this connection, I like to mention the name of the late Mr. Kôhati Syôzi, who was a staff member of the Amakusa Marine Biological Station, Kyûsyû Imperial University and was much interested in the study of Epicaridea. The specimens taken by him are included in this collection. His note-book which was sent to me by the courtesy of Mr. Miyake, has proved of much use in carrying out my study.

I am greatly indebted to Mr. Miyake for the present collection and for the privilege of working it out.

Genus *Apopenaeon* Nierstrasz and Brender à Brandis

1931. Nierstrasz and Brender à Brandis, Vidensk. Medd. fra Dansk naturh. Foren, vol. 91, p. 135 f.

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* Papers from the Amakusa Marine Biological Laboratory, No. 70.

Apopenaeon japonicum (THIELEMANN)

1910. *Epipenaeon japonicum*, THIELEMANN, Abh. Bayer. Akad. Wiss. Münnchen II, Supple. Bd. 3, Abh., pp. 79–81, text-figs. 86, 87.

1933. *Epipenaeon japonicum*, HIRAIWA, J. Sci. Hiroshima Univ., ser. B, div. 1, vol. 2, pp. 49–70.

1934. *Apopenaeon japonicum*, SHIINO, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 9, pp. 260–263, fig. 2.

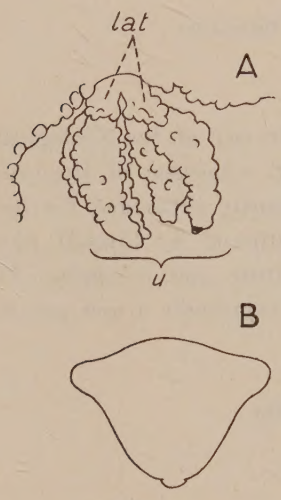

Fig. 1.
Apopenaeon japonicum (THIELEMANN).
A, ♀, 6th abdominal segment, dorsal view; B, ♂, abdomen, dorsal view. *lat*, lateral plate; *u*, uropoda.

Three females and a male parasitic on *Parapenaeus acclivis* RATHBUN were collected by K. SYÔZI and K. YASUMOTO at Tuyasaki, Hukuoka Prefecture, Kyûsyû in June 1930.

Measurement: Female (carrying male) length 11.4 mm, width 8.4 mm; male length 3.0 mm, width 1.2 mm.

Lateral plates of abdomen well developed in all females; terminal segment of the female accompanied by male bears rudiments of those plates (fig. 1, A, *lat*). Male abdomen slightly longer than Tanabe-Bay forms[1] and somewhat differently shaped. It is nearly triangular, projecting laterally at anterior border, and bearing a small papilla-like protuberance at posterior extremity.

Genus *Parapenaeon* RICHARDSON

1904. RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, p. 43 f.

Parapenaeon consolidata RICHARDSON
var. *richardsonae* SHIINO

1933. SHIINO, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 8, pp. 250–253, fig. 1.

A female accompanied by a male parasitic on *Parapenaeus acclivis* RATHBUN was taken at Tuyasaki, Hukuoka Prefecture, Kyûsyû by K. SYÔZI and K. YASUMOTO in June, 1930.

Measurement: female length 9.4 mm, width

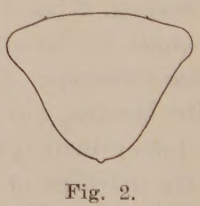

Fig. 2.
Parapenaeon consolidata var. *richardsonae* SHIINO.
Male abdomen, dorsal view.

1) SHIINO, 1934, no. 12, fig. 2, C.

7.1 mm; male length 2.0 mm, width 0.76 mm.

Abdomen of male (fig. 2) is slightly longer and somewhat more acuminate towards the end than in the type.[2)]

Genus *Pseudione* Kossmann

1881. Kossmann, Z. Wiss. Zool., vol. 35, p. 663.

Pseudione petrolistheae Shiino

1933. Shiino, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 8, pp. 271–273, fig. 8.

Three females each carrying a male were parasitic on *Petrolisthes japonicus* (de Haan), collected at Siraiwa-saki, Amakusa, Kyûsyû on August 25, 1937.

Measurement of the largest specimens: female length 3.7 mm, width 2.4 mm; male length 1.9 mm, width 0.8 mm.

Genus *Aporobopyrus* Nobili

1906. Nobili, Atti R. Accad. Sci. Torino, vol. 41, pp. 1108–1110.

Aporobopyrus ryûkyûensis n. sp.

Female (fig. 3, A & B): Asymmetrical, dorsal side slightly concave, ventral highly convex. No pigment. Length 6.2 mm, width 4.0 mm.

Cephalon distinct from thorax, one and a half times as broad as long; frontal border widely rounded and slightly bilobed, posterior border V-shaped. Anterior lamina narrow, produced on either side in a small triangular lobe. Eyes absent. Cephalic appendages visible from without. Maxillipeds with palp accuminating towards the tip.

Thoracic segmentation distinct. First 2 segments very short in mid-dorsal region. In those segments on both sides and in following 2 segments on longer side, postero-lateral parts about as long as or slightly shorter than antero-lateral parts; on shorter side of 3rd and 4th segments those parts very small, in last 3 almost absent. Coxal plates very narrow and rudimentary, present only in 2nd to 4th segments on both sides. Quadrangular ovarian bosses present in first 4 segments, though those of anterior-most somewhat indistinct. Lateral parts of last 3 segments with more or less uneven outline on longer side. Marsupium completely closed and highly vaulted.

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2) Shiino, 1933, no. 11, fig. 1, C.

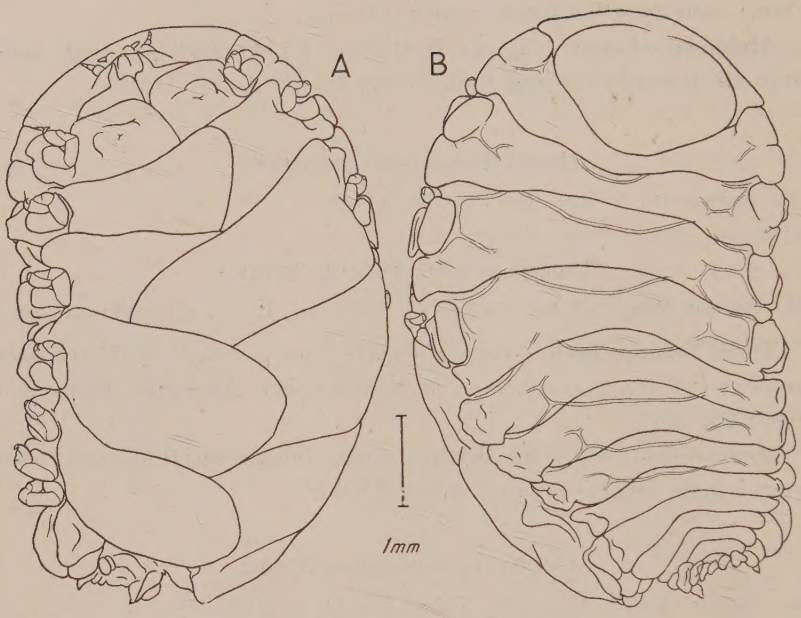

Fig. 3. *Aporobopyrus ryûkyûensis* n. sp., ♀.
A, ventral view; B, dorsal view.

Abdomen* (fig. 4, E & F) small, about twice as broad as long. Six segments completely separated and rapidly diminishing in size from anterior to posterior. First 5 arched in V-shape; lateral plates not well developed and round on margin. Last segment small, triangular, truncate on posterior margin and without lateral plates. Segmental borders slightly undulated on ventral surface. Five pairs of biramous pleopoda exposed for the most part and visible in dorsal view. Both external and internal rami ovate, directed postero-externally and gradually reduce in size towards posterior pair. External ramus longer than internal in all pairs. Uropoda uniramous, similar in appearance to pleopoda but smaller.

Male (fig. 4, A & B): Stumpy, with a few pigment spots as shown in fig. 4, A. Length 2.2 mm, width at 1st thoracic segment 0.97 mm.

Cephalon ovate, about 3/5 as long as broad, completely separated from 1st thoracic segment. Eyes present.

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* As the abdomen of the specimen taken from *Petrolisthes hastatus* is incomplete and broken, the description of this part is based on the specimen infesting *P. yaeyamensis*.

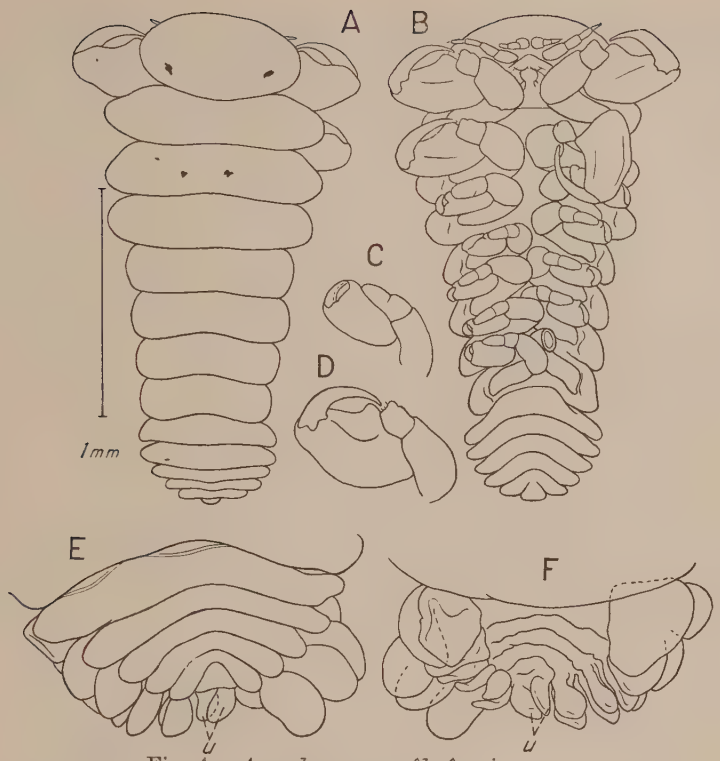

Fig. 4. *Aporobopyrus ryûkyûensis* n. sp.
A, ♂, dorsal view; B, ♂, ventral view; C, ♂, 3rd thoracic leg; D, ♂, 2nd thoracic leg; E, ♀, abdomen, dorsal view; F, ♀, same, ventral view. *u*, uropoda.

Thoracic segments distinct; 1st segment widest of all; from this segment on thorax gradually narrows posteriorly. Lateral parts of last 4 segments turned more ventrally than those of foregoing 3 segments. On account of this, 4th segment appears somewhat abruptly narrower than 3rd in dorsal view. First 2 pairs of legs much larger and stronger than the rest, and differ in constitution as shown in fig. 4, C & D.

Abdomen composed of 6 segments rapidly decreasing in size posteriorly. First segment slightly wider than last thoracic segment, but much shorter. Last segment very small and tuberculiform. Pleopoda and uropoda absent.

Remarks: Of 5 species of this genus so far recorded, the present species is most closely related to *oviformis* Shiino,[3] but it is distin-

3) Shiino, 1934, no. 12, pp. 265–268, fig. 4.

guished from the latter chiefly by the following characters: viz., in the female by the presence of 3 pairs of coxal plates instead of 2 pairs as in the latter, and by the absence of postero-lateral plates in the last 3 thoracic segments; and in the male by the strongly developed first 2 pairs of legs.

Occurrence: A female and a male were taken from the branchial cavity of *Petrolisthes hastatus* STIMPSON at Benoki, Okinawa-zima, Ryûkyû on February 9, 1937. Another female without male was found parasitic on *P. yaeyamensis* MIYAKE obtained at Kabira, Isigaki-zima, Yaeyama-Group, Ryûkyû on February 25, 1937. Description and figures given above are based on the former specimens except those of the female abdomen, about which the latter was used.

Aporobopyrus parvus n. sp.

Female (fig. 5, A & B): Slightly asymmetrical, with dorsal face slightly concave, ventral highly convex. No pigmentation except eye. Length 1.9 mm, width 1.1 mm.

Cephalon round in front, V-shaped behind, about as long as wide.

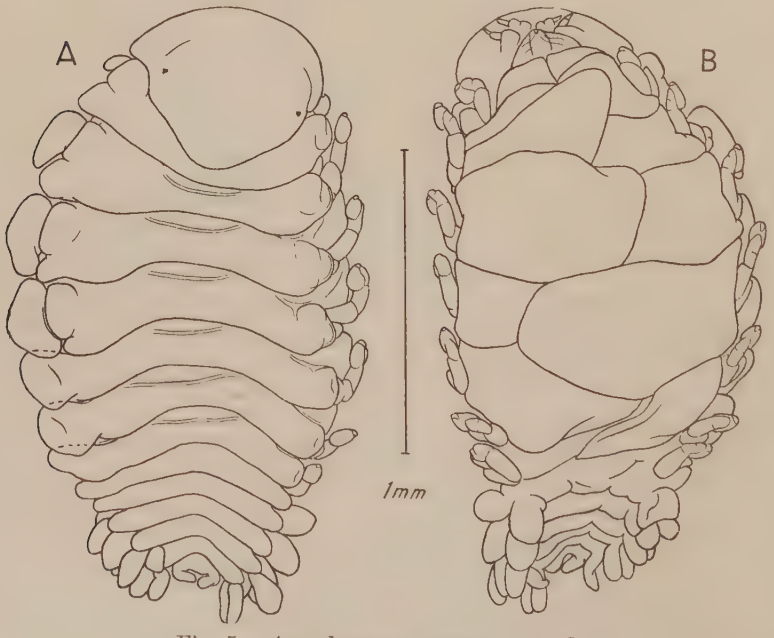

Fig. 5. *Aporobopyrus parvus* n. sp., ♀.
A, dorsal view; B, ventral view.

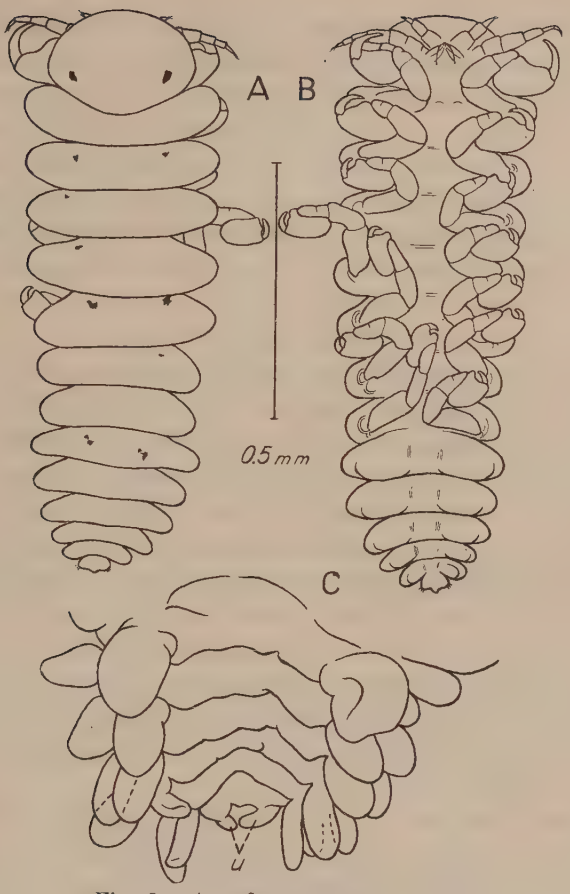

Fig. 6. *Aporobopyrus parvus* n. sp.
A, ♂, dorsal view; B, ♂, ventral view; C, ♀, abdomen, ventral view. *u*, uropoda.

Anterior lamina broad, but rather indistinctly demarked from cephalon in dorsal view. Eyes present at lateral corner. Antennae and oral cone not covered by maxillipeds but visible from without. Palp of maxillipeds wanting.

Thoracic segments separate. First segment shorter than other segments. First 4 segments bilobed on margin only on longer side; on shorter side of those segments and on both sides of other segments lateral margin not divided. Broad and lamellar coxal plates well developed in all segments on longer side, but almost rudimentary or absent on the other side. First plate of longer side much smaller than succeeding ones and shorter than antero-lateral part of segment;

2nd plate extends backwards as far as the middle of postero-lateral part; 3rd and 4th reach posterior end of segment; and last 3 plates inseparable from segment, but somewhat constricted at the base. Ovarian bosses very inconspicuous. Marsupium highly vaulted and complete, with all plates overlapping one upon another.

Abdomen (fig. 6, C) 3/5 as long as broad, with all segments distinct. First 5 segments arched anteriorly in V-shape; lateral plates round on margin, not well developed, exposing greater part of pleopoda in dorsal view. Last segment small, triangular, without lateral plates. Border of segments more or less undulated on ventral surface. Five pairs of pleopoda rather short and small. Both rami directed laterally or posteriorly; oval in anterior pairs, more or less lentiform in posterior pairs. Uropoda much smaller than last pleopoda, directed internally.

Male (fig. 6, A & B): Comparatively large; length 1.1 mm, width at 1st thoracic segment 0.38 mm. Pigment spots as shown in fig. 6, A.

Cephalon rather large, about 3/4 as long as broad, widely rounded in front, V-shaped behind. Eyes present. First antennae 3-jointed; 2nd antennae 6-jointed and extending laterally beyond cephalic margin.

Thoracic segments separate, round on lateral side. First segment curved anteriorly in lateral part, other segments nearly straight. From widest 1st segment, thorax gradually and slightly narrows backwards. First 2 pairs of legs somewhat larger than succeeding pairs, though identical in constitution.

Abdomen triangular, with 6 segments distinct. First segment wider than last thoracic segment. Lateral margin of first 5 segments rounded. Last segment cordiform; posterior margin produced in the middle in a small papilla and provided with a few setae on either side of it. Pleopoda and uropoda absent.

Remarks: Although the pleopoda are described as to be absent in the male, they are presumably represented by the pairs of very slight elevation of skin on the ventral surface as shown in fig. 6, B. These elevations are comparable to the similar structure of *aduliticus*[4] drawn by Nobili in his fig. 4, E. However, these structures are too inconspicuous to be termed as pleopoda.

The present species is most closely allied to *aduliticus* Nobili in having the coxal plates well developed on one side and rudimentary or absent on the other. It is distinguished from the latter in the

4) Nobili, 1905, no. 8, pp. 1106–1108, fig. 4.

absence of postero-lateral plate on the shorter side of thorax, in the absence of palp in maxillipeds and in that the pleopoda and uropoda are much shorter than in *aduliticus*. The difference from *ryûkyûensis* is found in the constitution of coxal plates in the female, as well as of the first 2 legs in the male.

Occurrence: A female and a male was found parasitic in the branchial cavity of Pisosoma sp. collected in the Yaeyama-Group, Ryûkyû.

Genus *Metabopyrus* n. gen.

Female cephalon separated from thorax.

Thoracic segments distinct. Coxal plates present in first 4 segments, but not highly developed. Marsupium completely closed.

Abdomen composed of 5 segments, having last 2 entirely coalesced. Lateral plates well developed, but not freely projected. Five pairs of biramous pleopoda and uniramous uropoda present.

Male cephalon, 7 thoracic and 6 abdominal segments completely separated.

Neither pleopoda nor uropoda.

In the complete coalescence of the 5th and 6th abdominal segments of the female the new genus is closely related to *Orbimorphus* Richardson,[5] *Epipenaeon* Nobili[6] and *Bopyriscus* Richardson.[7] The differences from those genera are tabulated below:

		Metabopyrus	*Orbimorphus*	*Epipenaeon*	*Bopyriscus*
Female	Coxal plates of thoracic segments	developed in first 4	developed in first 4	well developed in all 7	rudimenatry
	Lateral plates of abdomen	developed	rudimentary	well developed	not well developed
	Frontal lamina	absent	present	present, very broad	absent
	Pleopoda	5 pairs	4 pairs	5 pairs	5 pairs
	Uropoda	uniramous	biramous	biramous	absent
Male	Abdominal segments	separated, 6 in number	fused	fused	separated, 4 in number

5) Richardson, 1911, no. 10, pp. 79–85.
6) Nobili, 1905, no. 8, pp. 1099–1101.
7) Richardson, 1905, no. 9, pp. 562–563.

The new genus bears some resemblance to *Probopyrus* Giard and Bonnier especially in the constitution of the female abdomen. In *Probopyrus* (including *Palaegyge* Giard and Bonnier) Nierstrasz and Brender à Brandis (1929)[8] state that "Pleomere und Pleotelson frei oder einigermassen verwachsen;—Uropode schwach entwickelt." As regards this point the new genus appears, at the first glance, to be identical with *Probopyrus*. However, so far as I am aware, the fusion of the segments in that genus always occurs only in the mid-dorsal region and never extends to the lateral part as in the last 2 segments of the present case. Moreover, the uropoda of *Metabopyrus* can not be regarded as rudimentary. The marsupium is completely closed unlike in *Probopyrus* in which it is widely open.

On the male abdomen of *Probopyrus* the same authors say that "Pleomere niemals alle frei; Verwachsung aber sehr auseinander gehend." Therefore, the condition is quite different betwen the two genera.

Further, all the species of *Probopyrus* infests on Palaemonidae except *plesionikae* Barnard and *dubius* Nz. & B. à B. (The former species was contended by Chopra[9] as not belonging to this genus; the latter[10] also may not be *Probopyrus* in my judgement), while the new Bopyrid is a parasite of *Upogebia*.

On these ground I differentiate the present specimen from *Probopyrus* and erect a new genus for it.

Metabopyrus ovalis n. sp.

Female (fig. 7, A): Body large, ovate, very slightly asymmetrical. Length 11.6 mm, width 9.5 mm. Dorsal surface flat, ventral convex. No pigment.

Cephalon distinct from thorax, wider than long; anterior margin nearly straight, lateral and posterior borders somewhat irregular. Frontal lamina not developed. Eyes absent.

Thoracic segments separate, segmental borders more or less notched in mid-dorsal part. Postero-lateral parts very small, but distinct in 1st segment, rudimentary or absent in the rest. Moderately broad coxal plate occupies antero-lateral part of 1st segment, extends along entire

8) Nierstrasz and Brender à Brandis, 1929, no. 5, p. 18.
9) Chopra, 1923, no. 2, p. 486.
10) Nierstrasz and Brender à Brandis, 1929, no. 5, p. 25.

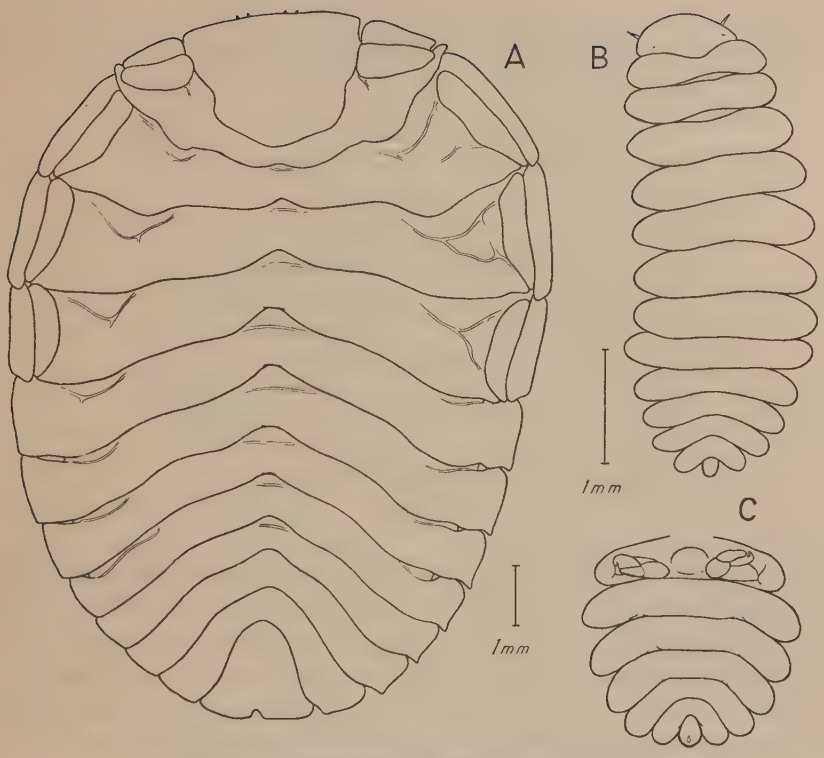

Fig. 7. *Metabopyrus ovalis* n. gen. & n. sp.
A, ♀, dorsal view; B, ♂, dorsal view; C, ♂, abdomen, ventral view.

length of lateral margin in succeeding 3 segments, and completely inseparable from segment in the last 3. Ovarian bosses nearly as broad as coxal plates, present in first 4 segments. Antero-lateral corner of last 3 segments rounded; postero-lateral corner angular on shorter side, slightly produced on longer side. Borders of posterior segments provided with rugae or a row of papilliform processes on ventral side. Marsupium completely closed, with all plates overlapping one upon another.

Abdomen (fig. 8) composed of only 5 segments. First 4 segments bear close resemblance to thoracic ones in dorsal view, and similarly rounded at antero-lateral corner; postero-lateral corner angular on shorter side and produced on longer side. 5th and 6th segments completely fused in a bell-shaped single segment, leaving no indication of original segmentation both dorsally and laterally. Posterior margin of this segment widely rounded and provided with a notch in the

Fig. 8. *Metabopyrus ovalis* n. gen. & n. sp.
Female abdomen; *en*, endopodite; *ex*, exopodite; *u*, uropoda.

middle. On ventral surface, segmental borders smooth except in 1st. Five pairs of pleopoda completely covered under lateral plates; biramous, and tuberculated on surface and on margin. Marginal part of endopodite divided into larger internal and smaller external lobes. Exopodite smaller than endopodite and not bilobated. Uropoda also largely covered by abdomen, uniramous, foliaceous, tuberculated and similar in appearance to exopodite of pleopoda.

Male (fig. 7, B): Body large and stumpy. Length 4.1 mm, width at 1st abdominal segment 1.64 mm. No pigment except eye.

Cephalon small, twice as broad as long, semicircular in front, V-shaped behind and distinct from thorax. Small eyes present. Antennae extending laterally beyond cephalic margin.

Seven thoracic segments separate, with rounded lateral parts. They gradually decrease in width from 7th segment forewards, but subequal in length except 1st and 2nd, which are much shorter than other segments and have borders depressed in the middle. Medioventral tubercles distinct at least in last 4 segments.

Abdominal segments (fig. 7, C) completely separated, rounded on margins and rapidly diminishing in size from first to last. First segment straight, widest of all, and even wider than 7th thoracic segment. Succeeding 4 segments more or less arched anteriorly, last segment very small and papilliform. Pleopoda and uropoda absent.

Occurrence: Two females each carrying a male were obtained

from the branchial cavity of *Upogebia major* (DE HAAN) collected in Hakata Bay, Kyûsyû on June 2, 1931 by K. SYÔZI and K. YASUMOTO.

Genus *Bopyrella* BONNIER

1900. BONNIER, Trav. Stat. Zool. Wimereux, vol. 8, p. 347.

Bopyrella crenulata n. sp.

Female (fig. 9, A & B): Body flat on both surfaces, slightly asymmetrical, pyriform. No pigment except that of eye. Length 9.1 mm, width 5.5 mm.

Cephalon completely fused with 1st thoracic segment, posterior limit being indicated by a pair of short and shallow grooves present in mid-dorsal region. Anterior border finely crenulated. Group of eye pigments at each antero-lateral corner. Maxillipeds bear palp ciliated on margin.

Thoracic segmentation distinct. Second segment measured in mid-dorsal part much shorter than the following segments. First 4 segments provided with narrow ovarian bosses and more or less broader coxal plates on either side; the plates on shorter side turned upwards.

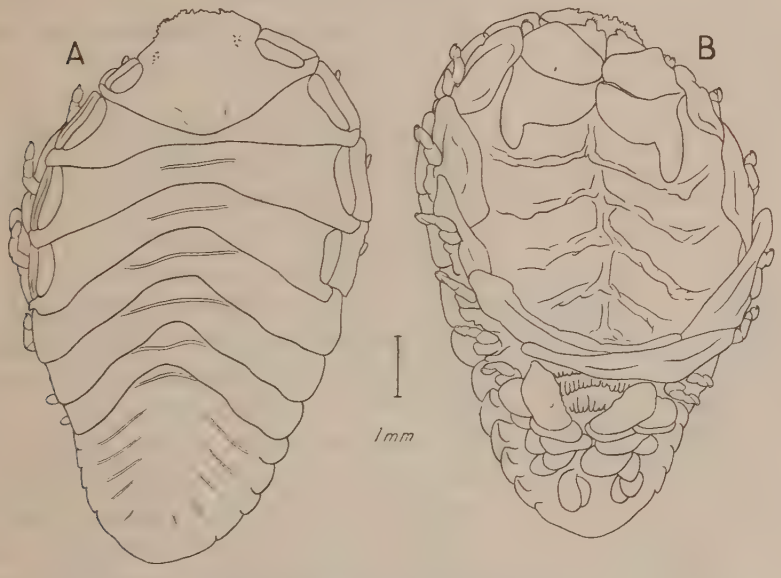

Fig. 9. *Bopyrella crenulata* n. sp., ♀.
A, dorsal view; B, ventral view.

Postero-lateral parts of those segments very small. Lateral margin of last 3 segments undivided, truncate on shorter side and rounded on the other side. Segmental borders indicated on ventral side by transverse ridges of skin. Marsupium widely open; 1st oostegite provided with linguiform posterior elongation; succeeding 3 small, subtriangular and the last pair elongate to complete the posterior side of marsupium.

Abdomen rounded in outline, nearly as long as broad, with all segments distinct only laterally. Segmentation line obsolete completely on dorsal face and largely on ventral face; borders of anterior segments have longitudinal rugae on latter surface. Lateral plates round on margin, imbricate one upon another and with ventral ridge on longer side, while they are very slightly imbricate or not imbricate and without ridge on shorter side. Last 2 segments completely fused even in those parts. Five pairs of pleopoda biramous. Both rami more or less ovate. Endopodite of first 4 pairs directed inwards, that of 5th and exopodite of all pairs outwards. Uropoda absent.

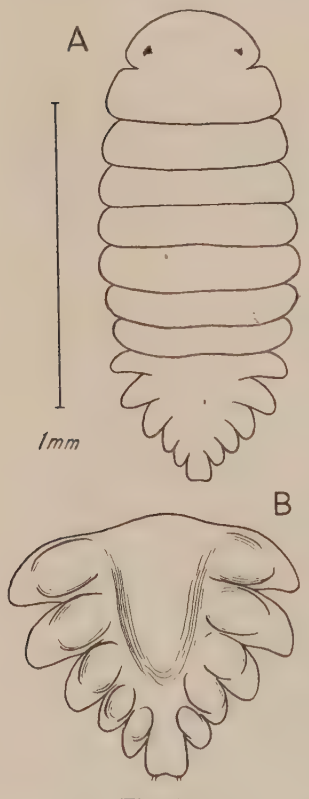

Fig. 10.
Bopyrella crenulata n. sp., ♂.
A, dorsal view; B, abdomen, ventral view.

Male (fig. 10, A): Short and stocky, length 1.55 mm, width at 5th thoracic segment 0.67 mm. Without pigment except eye.

Cephalon semicircular, about twice as broad as long; fused posteriorly with 1st thoracic segment, but distinct laterally by marginal notch. Eyes small.

First thoracic segment longest of all and truncate on margin; other segments more or less rounded. Fifth segment widest, and from this segment on body gradually narrows towards both ends.

Abdomen (fig. 10, B) triangular, broader than long. All segments fused in mid-dorsal and ventral regions; borders distinct only for a short distance from margin. Lateral plates somewhat acuminate and well separated from one another.

Last segment nearly square; posterior margin slightly notched in the middle and bears a few minute setae on either side. Ventral surface excavated in the middle, and provided with 5 pairs of rudimentary oval pleopoda around this excavation. Uropoda absent.

Remarks: The most characteristic point of the present species is the crenulation of the cephalic margin. The new species is nearly allied to *angusta* Shiino,[11] *intermedia* Nz. & B. à B.,[12] and *distincta* Nz. & B. à B.,[13] in having imbricated lateral plates in the female abdomen as well as in the structure of the same parts in the male, but it is distinguished from these species in the characters shown in the following table:

		crenulata	*angusta*	*intermedia*	*distincta*
Female	Ovarian boss	present	absent	absent	absent
	Abdominal segmentation	distinct only on margin	distinct only on margin	distinct only on margin	distinct for a short distance from margin
	Margin of abdominal segment VI	round	round	slightly notched	deeply notched
Male	Abdominal segmentation	distinct for a short distance from margin	distinct only on margin	—	distinct for long distance from margin
	Margin of abdominal segment VI	notched in the middle	somewhat irregular, but not notched	—	entire
	Pleopoda	present	absent	—	absent

Occurrence: Seven females each carrying a male were taken by K. Syôzi from the branchial cavity of *Alpheus japonicus* Ortmann colletced in Tomioka Bay, Amakusa, Kyûsyû on September 23, 1930.

Genus *Bopyrina* Kossmann

1881. Kossmann, Z. Wiss. Zool., vol. 35, p. 667.

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11) Shiino, 1936, no. 13, pp. 157–159, fig. 1.
12) Nierstrasz and Brender à Brandis, 1923, no. 4, p. 96, pl. 6, fig. 21.
13) Nierstrasz and Brender à Brandis, 1923, no. 4, p. 97, pl. 6, fig. 22.

Bopyrina amakusaensis n. sp.

Female (fig. 11, A & B): Very asymmetrical, elongate pyriform. Dorsal surface slightly concave, left anterior region of body bending upwards; ventral surface almost flat. No pigment except that of eye. Length 3.0 mm, width 1.7 mm.

Cephalon fused with 1st thoracic segment, suture line faintly visible in lateral portion as a pair of shallow grooves (fig. 12, A). Frontal margin V-shaped and rolled up dorsally on shorter side. Very small eyes present at antero-lateral corner. Both pairs of antennae exposed, similar in structure, biarticulated. Maxillipeds bear palp fringed by 3 or 4 setae.

First 2 free thoracic segments much shorter than other segments in mid-dorsal region. Lateral parts, especially in 2nd to 5th segments, greatly expanded on right side. Those parts of first 4 segments bilobed on the same side and with very small postero-lateral parts, while they are undivided on left side of these segments and on both sides of last 3 segments. Narrow coxal plates present in anterior 4 segments, those

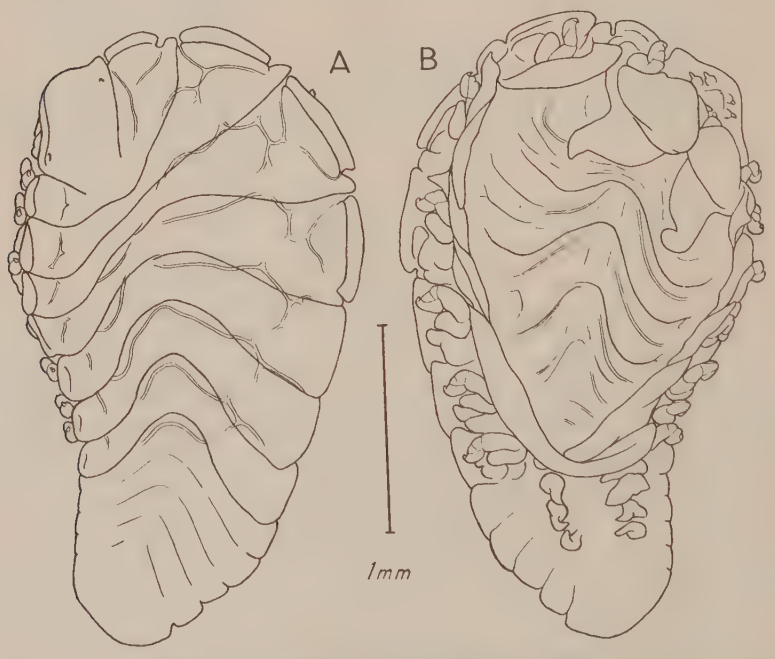

Fig. 11. *Bopyrina amakusaensis* n. sp., ♀.
A, dorsal view; B, ventral view.

of shorter side rolled up dorsally. Ovarian bosses absent. Segmental borders on ventral surface rather inconspicuous. Marsupium widely open. First oostegite covers greater part of maxilliped; terminal elongation of posterior lobe triangular on longer side, rounded on the other side. Following 3 pairs small and narrow; last pair also narrow, but elongated to complete posterior boundary of marsupium.

Abdomen (fig. 12, D) longer than wide; breadth near posterior extremity about half of that at anterior extremity. All segments fused; but segmentation indicated dorsally by a rather inconspicuous line and laterally by very shallow notches in first 4 segments. Marginal notches somewhat deeper on longer side; lateral plates of first 3 segments imbricate on this side. Last 2 segments completely fused both on dorsal and lateral sides, and having rounded and entire margin. Segmental borders completely obsolete on mid-ventral surface. Four pairs of uniramous pleopoda very small and irregular in shape. In mid-ventral region inside of pleopoda, 3 pairs of indistinct semicircular tubercles present, probably indicative of rudiment of endopodite. Last pair of pleopoda and uropoda absent.

Male (fig. 12, B): Very short and stumpy, length 0.71 mm, width at 3rd thoracic segment 0.27 mm. No pigment, even without eye.

Cephalon completely fused with 1st thoracic segment, only a slight marginal depression between the two marking its posterior limit. Frontal margin also somewhat depressed in the middle.

Thoracic segments round on margin, 3rd segment widest. Abdominal piece (fig. 12, C), formed by complete fusion of segments, nearly cordiform, very slightly wider than long. Only 3 segments indicated on lateral side by marginal undulation. Posterior extremity produced in a pair of slight papilliform processes. Pleopoda represented by 3 pairs of inconspicuous round protuberances. No uropoda.

Remarks: In the constitution of abdomen the female of this species closely resembles that of *giardi* Bonnier,[14] *virbii* Walz,[15] *ocellata* Czerniavsky,[16] *gigas* Nz. & B. à B.,[17] *sewelli* Chopra,[18] and *abbreviata* Richardson,[19] in that the marginal notches are very inconspicuous or entirely missing on the shorter side. The new species, however, is quite different from those species in the feature of male

14–16) Bonnier, 1900, no. 1, pp. 365–370, pls. 39, 40.
17) Nierstrasz and Brender à Brandis, 1923, no. 4, p. 99 f, pl. 7, fig. 24.
18) Chopra, 1930, no. 3, pp. 144–147, pl. 6, figs. 6–11.
19) Richardson, 1905, no. 9, p. 563 f, figs. 620–623.

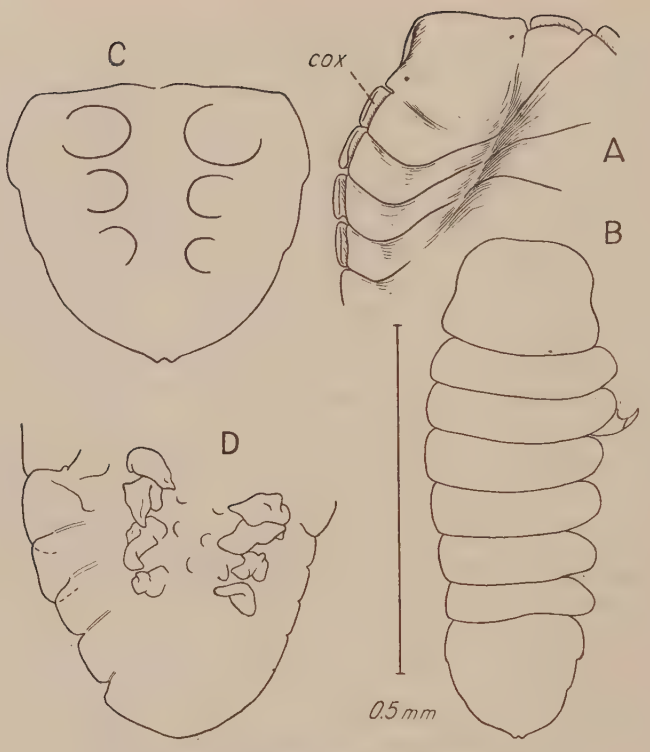

Fig. 12. *Bopyrina amakusaensis* n. sp.
A, ♀, anterior portion of body, dorsal view; B, ♂, dorsal view; C, ♂, abdomen, ventral view; D, ♀, abdomen, ventral view.
cox, coxal plate.

abdomen, which is very short and cordiform, being composed of only 3 segments and bearing rudimentary pleopoda, while it is much elongated, and has deeper marginal notches and no pleopoda in those species.

Occurrence: A female accompanied by a male was obtained at Amakusa, Kyûsyû from the branchial cavity of *Periclimenes* sp. According to Mr. Miyake, the host is said to dwell in a kind of sponge and belongs to a new species which will be described by him shortly.

Genus *Portunicepon* Giard and Bonnier

1887. *Portunicepon*, Giard and Bonnier, Trav. Inst. Zool. Lille et Lab. Zool. Mar. Wimereux, vol. 5, p. 73 f.
1893. *Ergne* (pro parte), Stebbing, A History of Crustacea, p. 413 f.
1934. *Portunicepon*, Shiino, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 9, p. 274.

Portunicepon goetici SHIINO

1934. SHIINO, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 9, pp. 274–277, fig. 8.

1) A female and a male parasitic on *Goetice depressus* (DE HAAN) taken at Amami-ôsima, Ryûkyû on February 3, 1937.

Measurement: female length (excluding uropoda) 5.4 mm, width 4.3 mm; male length 2.0 mm, width 0.66 mm.

Female body somewhat broader than Tanabe-Bay form[20]; lateral plates and pleopoda not extending laterally beyond thoracic breadth; uropoda very long as in the type. Medio-dorsal processes present in 6th thoracic and 1st abdominal segments, higher than in the type (fig. 13, B). Male abdomen somewhat different in shape from the type, as shown in fig. 13, A. Medio-ventral tubercles in 2nd–7th thoracic and 1st and 2nd abdominal segments.

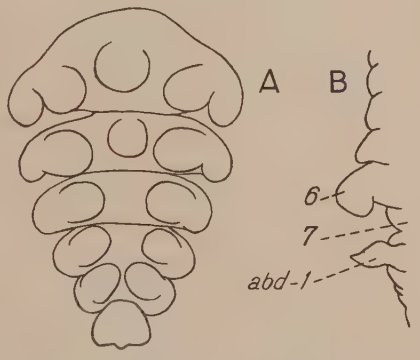

Fig. 13. *Portunicepon goetici* SHIINO. A, ♂, abdomen, ventral view; B, ♀, medio-dorsal processes, lateral view. 6, 7: 6th and 7th thoracic segments; abd-1: 1st abdominal segment.

2) Only a female parasitic on *Macrophthalmus japonicus* DE HAAN caught at Sioiri, Tomioka Bay, Amakusa, Kyûsyû on August 26, 1937.

Measurement: length (excluding uropoda) 4.6 mm, width 3.4 mm.

Cephalon round, with frontal lamina somewhat trilobate. Ovarian bosses very conspicuous, slightly constricted at the base. Third to 7th thoracic segments arched anteriorly; 6th segment not produced into medio-dorsal process, but with slight median longitudinal furrow; 7th segment sunk from general surface; 1st abdominal segment elevated. Pleopoda and lateral plates directed antero-laterally. Other points as in the type.

Genus *Apocepon* NIERSTRASZ and BRENDER À BRANDIS

1930. NIERSTRASZ and BRENDER À BRANDIS, Proc. U. S. Nat. Mus., vol. 77, pp. 7–9.

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20) SHIINO, 1934, no. 12, pp. 274–277, fig. 8.

Apocepon pulcher Nierstrasz and Brender à Brandis

1930. Nierstrasz and Brender à Brandis, Proc. U. S. Nat. Mus., vol. 77, pp. 7–9, figs. 17–20.
1934. Shiino, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 9, p. 273, fig. 7.
1936. Shiino, Rec. Oceanogr. Wks. Jap., vol. 8, p. 160 and p. 185.

A female carrying a male infesting *Philyra pisum* de Haan obtained at Sioiri, Tomioka Bay, Amakusa, Kyûsyû on August 26, 1937.

Measurement: female length 2.6 mm, width 0.5 mm; male length 5.6 mm, width 3.5 mm.

Dr. H. Ohshima (1931) and Mr. K. Syôzi (1931) have reported the infection of a Bopyrid on *Philyra pisum* collected in the same locality.[21] There may be no doubt that it belongs to the present species.

Genus *Athelges* Hesse

1881. Hesse, Ann. Sci. Nat., ser. 4, vol. 15, p. 112 f.

Athelges takanoshimensis Ishii

1914. Ishii, Annot. Zool. Japon., vol. 8, pp. 519–530.
1934. Shiino, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 9, p. 277 f, fig. 9.
1936. Shiino, Rec. Oceanogr. Wks. Jap., vol. 8, p. 186.
1937. Shiino, Annot. Zool. Japon., vol. 16, p. 299.

Six females and 5 males parasitic on *Eupagurus* sp. collected at Kasii, Hukuoka Prefecture, Kyûsyû on August 1931 by K. Yasumoto.

Measurement of largest specimen; female length (excluding abdomen) 7.3 mm, width 4.4 mm; male length 2.5 mm, width 0.8 mm.

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2. Chopra, B., 1923. Bopyrid Isopods parasitic on Indian Decapoda Macrura. Rec. Ind. Mus., vol. 25, pp. 411–550.
3. ——, 1930. Further Notes on Bopyrid Isopods parasitic on Indian Decapoda Macrura. Rec. Ind. Mus., vol. 32, pp. 113–147.
4. Nierstrasz, H. F. and Brender à Brandis, G. A., 1923. Die Isopoden der Siboga-Expedition II, Isopoda Genuina, Epicaridea. Siboga-Exped., 95, monogr. 32b., pp. 57–121.
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21) Ohshima, 1931, Dobut. Zasshi (Zool. Mag.), vol. 42, p. 30; Syôzi, 1931, ibid., p. 329.

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8. Nobili, G., 1905. Nuovi Bopiridi. Att. R. Accad. Sci. Torino, vol. 41, pp. 1098–1113.
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10. ——, 1911. Report on Isopods from Peru, collected by Dr. Coker. Proc. U. S. Nat. Mus., vol. 38, pp. 79–85.
11. Shiino, S. M., 1933. Bopyrids from Tanabe Bay. Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 8, pp. 249–300.
12. ——, 1934. Bopyrids from Tanabe Bay II. Ibid., vol. 9, pp. 257–287.
13. ——, 1936. Bopyrids from Tanabe Bay III. Ibid., vol. 11, pp. 157–174.
14. ——, 1937. Bopyrids from Tanabe Bay IV. Ibid., vol. 12, pp. 479–493.

On Some Recent Brachiopoda from Seto, Prov. Kii

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(With 8 Text-figures)

The materials of the present article consist of some recent brachiopods forwarded to the writer for specific identification by Dr. Fujio Hiro of the Seto Marine Biological Laboratory of the Kyôto Imperial University. At this place the writer wishes to offer his warmest thanks to Dr. Fujio Hiro for so kindly forwarding the specimens to his study.

According to a letter accompanying the specimens, the materials were all caught in the nets of fishermen in the vicinity of Seto, Prov. Kii, and therefore, the precise localities in terms of latitude and longitude as well as their respective depths, bottom materials and temperatures are not known. However, from the fact that they were caught in the nets of fishermen, it seems that they are from depths less than 100 fathoms, and a good calculation would be around some 50 fathoms or less.

Identification of the specimens revealed the following few species, namely:

1. *Lingula unguis* (Linnaeus), this species is very rare in the vicinity of Seto, and only a single specimen was collected from Ezura near Seto. Although this is a common inland-sea species, it was found in waters of the open sea. From literature, it appears that this species is particularly common in the waters of the Philippine Islands.

2. *Neohemithyris lucida* (Gould), this species is frequently found in the warm waters of Japan, and as fossil, it is particularly noteworthy in the Ryûkyû limestone formation of Kikai-zima of the Ryûkyû Islands.

3. *Hemithyris psittacea woodwardi* (A. Adams), this special form of *Hemithyris* is also said to occur in the vicinity of Kii (Sp. No. 2314), according to a letter from Dr. Hiro. Besides this subspecies, the others

listed below with "Sp. No.", are in the collection of the Kyôto Imperial University, and collected by the late Dr. Y. HIRASE, a Japanese pioneer in conchology.

4. *Terebratulina pacifica* YABE and HATAI, this species is fairly variable in its shell outline and is widely distributed in the waters of Japan.

5. *Terebratulina kiiensis* DALL and PILSBRY, (Sp. No. 2319), this species was first collected by Mr. STEARNS from the coast of Kii, and later described by W. H. DALL and H. PILSBRY. The large size, rotund outline and numerous radial striae and nearly equally convex valves, are characteristic of this species. From the province of Kii, it is known to extend its distribution into the west American waters.

6. *Terebratulina japonica* (SOWERBY), this species is a very confusing one, and its true relationship to such forms as *T. pacifica* YABE and HATAI, *T. retusa* (LINNAEUS), *T. callinome* DALL and others is not well known, as the species-value is said to lie in the kind of spicules. The species-value lying in the kind of spicules is one of the chief reasons for confusion, since previous authors have not figured the kind of spicules occurring in all of the species of *Terebratulina*. As known at present, this species is a typical Japanese element.

7. *Gryphus stearnsi* (DALL and PILSBRY), this species was originally described from the coast of Kii province, and is said to be common in the seas of Kii province. Also it is fairly well represented in the waters of Sagami Bay. (Sp. No. 2315).

8. *Gryphus davidsoni* (A. ADAMS), this species shows no folding of the valves as in *G. stearnsi*, and in the adult stage it never becomes larger than one half of that of *stearnsi*. The wedge shape, rectimarginate to incipient folding of the valves and small size are a few of its features. (Sp. No. 2316).

9. *Terebratalia coreanica* (ADAMS and REEVE), the occurrence of this species is very interesting as it is a northern rather than a southern form, and to find it in the vicinity of Seto is worthy of particular mention.

10. *Campages basilanica* DALL, this species was originally described by W. H. DALL from off Basilan, in the Philippine Islands, and is now known to be distributed to Central Japan.

11. *Dallina raphaelis* (DALL), this species is said to be common in the vicinity of Kii province, and is fairly widely distributed in the waters of Japan.

12. *Laqueus quadratus* YABE and HATAI, this species is very widely distributed in the waters around Japan, but is less distributed compared to its nearest allied species, *Laqueus blanfordi* (DUNKER).

13. *Laqueus rubellus* (SOWERBY), this is one of the confusing species of the Japanese fauna and is one of the most widely distributed forms, being abundant at almost every place where it is known to occur. (Sp. No. 2324).

14. *Laqueus japonicus* YABE and HATAI, this species appears to be the Japanese representative of the northwest American *Laqueus californicus* (KOCH), but instead of having a thin shell with reddish coloration, the Japanese one generally has a thicker shell with brownish coloration. The occurrence of this species in the vicinity of Seto, is an extension of its southern distribution, which has hitherto been taken as Sagami Bay, Central Japan.

15. *Laqueus pallidus* sp. nov., it was interesting to find a new species in the fauna from Kii province, and its description is given in later pages.

16. *Pictothyris picta* (DILLWYN), this species is hardly distinguishable from *Laqueus rubellus* (SOWERBY), above mentioned, but as shown in later pages the difference existing between the two is of generic value.

Of the species in the collection, *Laqueus rubellus* (SOWERBY) and *Pictothyris picta* (DILLWYN) are of particular interest for the reason that upon external characters their distinction from one another is very hard, in fact so hard, that certain authors have been inclined to regard them as conspecific. *Laqueus pallidus* is also of interest in the fact that the much compressed nature of the valves and the white coloration are two features which are generally not found in the species of the genus *Laqueus*. As detail discussion on the other species will be given elsewhere, the discussions in the present article will be devoted to *Laqueus rubellus* and *Pictothyris picta*, while *Laqueus pallidus* will be described.

Besides the species found in the collection of brachiopods forwarded to the writer by Dr. HIRO, the following are known to occur in the waters adjacent to Kii province, namely:

17. *Lingula adamsi* DALL, this species is not a well known one, and subsequent to DALL's article "Annotated List of the Recent Brachiopoda in the United States National Museum, with Descriptions of Thirty-Three New Forms," there appears to be no record of it.

18. *Lingula lepidula* A. ADAMS, this species, like the former has hardly no records of occurence since 1920.

19. *Craniscus japonicus* (A. ADAMS), this species commonly adheres to rocky bottoms and is hardly ever caught in the nets of fishermen, although dredge operation frequently reveals its presence.

20. *Hemithyris psittacea* (GMELIN), this species is widely distributed in the northern hemisphere, being found in nearly all seas.

21. *Terebratulina crossei* DAVIDSON, this species ranges from the Kii channel to the west coast of North America.

22. *Terebratulina callinome* DALL, this species is said to be similar to the young of *T. crossei*, yet was originally labeled as "*T. japonica*." The species has not been figured and therefore the precise characters are not well known.

23. *Jolonica nipponica* YABE and HATAI, this species does not seem to be found near shore, but dredge operation reveals its presence in the waters adjacent to Kii province.

24. *Laqueus blanfordi* (DUNKER), this species is widely distributed around Japan, and instead of living in shallow waters, it generally inhabits a sea bottom of moderate depths away from the shore.

Altogether there are twenty-four species of recent Brachiopoda now known from the vicinity of Kii province, and of them the following are purely southern in distribution, namely, *Campages basilanica* DALL, *Pictothyris picta* (DILLWYN), and *Jolonica nipponica* YABE and HATAI. The genus *Lingula* is also southern or western in distribution, even though there are species known in the region of northern Japan.

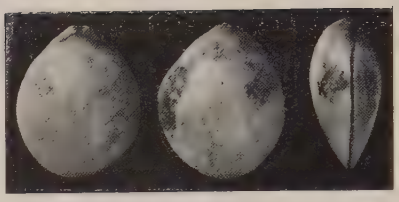
Laqueus pallidus sp. nov.

(Text-figures 1–3)

Shell moderate in size, ovate in outline and pallid in color with subtransparent aspect; test fine and densely punctate; valves nearly equally convex. Both anterior and lateral commissures straight, the anterior showing no sign of fold or sinus. Surface provided with obsolete concentric growth lines which are crowded at lateral sides as usual but do not corrugate anterior margin. Hinge-line moderately angulate. Beak moderately swollen, obliquely truncated by a permesothyrid foramen of nearly circular shape; deltidial plates broken, but were probably conjunct; beak ridges defined. Interior features of shell, such as cardinalia of dorsal valve and hinge-teeth of ventral valve

as in the typical members of the genus. Loop and animal not preserved, but features of cardinalia refer it to the named genus.

Length of shell 20.0, width 16.5, depth 9.2 mm.



Figs. 1–3. Dorsal, ventral and lateral views of *Laqueus pallidus* sp. nov. Note the compressed nature of the shell, and the remarkable pallid coloration and obsolete growth lines of the shell. Type preserved in the Seto Marine Biological Laboratory.

The thin test, ovate outline and subtransparent shell of the present species as well as the compressed nature of the valves are features which serve in distinguishing the present one from the other members of the genus from Japan, both recent and fossil.

At first sight, the present shell resembles the white varieties of *Pictothyris picta* (DILLWYN), but the interior features of the shell easily distinguish it from that genus. Of the members of *Laqueus* from Japan, probably *L. hanawaensis* HAYASAKA, a fossil species from Akita Prefecture may come close, however, there is no evidence for uniting the recent one with the fossil one.

In the following lines are given discussions on the genera *Laqueus* and *Pictothyris,* two characteristic genera of the Japanese Brachiopoda fauna.

Among the Tertiary and recent brachiopod genera known from the region of Japan, there are many which have caused much confusion to students in other branches of biologic research as well as to the geologist. Of the various brachiopod genera, *Laqueus* and *Pictothyris* are interesting in particular. First because they possess species externally indistinguishable or at least hardly distinguishable from one another, and second, because the former is best developed and has many species in the Tertiary and younger deposits of Japan, while the latter genus is restricted in both fossil and living distribution to the region of Japan. In the view that considerable interest has been directed toward these two genera, and also at the request of a friend, the present discussion is written, with the hope that it may furnish clear evidence of the relationship between the mentioned genera.

Laqueus is a genus established by W. H. DALL[1] in 1870, taking

1) W. H. DALL: Amer. Jour. Conch., VI, 123, 1870. J. A. THOMSON: Brach. Morph. Gen., 258–260, 1927.

Terebratula californica Koch[2] as the genotype. This is a species known to be living between British Columbia to California, and has also been recorded from the Pliocene of California. The genotype was described in detail by J. A. Thomson,[3] in the following manner:—

"Shell large, ovate, hinge-line curved, biconvex rectimarginate to ligate or strangulate, test smooth, rather coarsely punctate, colour yellow-brown to red, sometimes with bright-red rays. Beak fairly prominent, beak-ridges sharp, foramen small to moderate, permesothyrid, slightly remigrant, telate, deltidial plates conjunct, concave. Hinge-teeth supported by dental plates, which are ventrally recessive; area between dental plates slightly calloused, pedicle-collar (or striated area) sessile, long, but not reaching as far forward as the dental plates. Cardinalia characterized by inner and outer hinge-plates separated by the crural bases, as in *Dallina*, the inner hinge-plates resting on the median septum; no cardinal process, but a small striated area or pit over the umbo. Septum extending forward more than one-third the length of the valve. Loop long, reflected, attached to the septum by connecting bands as in *Terebratalia*, the ascending branches united to the descending branches by interconnecting bands on each side in the neighborhood of the connecting bands. Muscular impressions not strong. Small spicules present over the pallial sinuses, but not extending to the body-wall or lophophore."

The many species now known of the genus *Laqueus*, all agree with one another in the possession of a dalliniform cardinalia, the peculiar shape of the loop, and in the permesothyrid foraminal position. In other features, such as curvature of the anterior and lateral commissures, convexity of the valves, strength of the surface sculpture, coloration of the shell and general outline, certain variations exist which are generally within recognizable limits,—the basis for specific separation. Upon the characters just mentioned, the following species may be considered as valid, namely:—

1. North American species

Laqueus californicus (Koch)

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2) T. Davidson: Trans. Linn. Soc., Ser. 2, IV (2), 112, pl. 18, figs. 6–9, 1887. W. H. Dall: Proc. U.S. Nat. Mus., LVII (2314), 348–350, 1920.

3) J. A. Thomson: Brach. Morph. Gen., 258–259, fig. 85, 1927. S. Nomura and K. Hatai: Saito Ho-on Kai Mus., Res. Bull., XIII, 187–188, pl. 25, figs. 5–10, 1937.

L. californicus vancouvrensis Davidson
L. erythraeus Dall

2. Japanese species

Laqueus rubellus (Sowerby)	*Laqueus rubellus obessus* Yabe and Hatai
L. blanfordi (Dunker)	*L. concentricus* Yabe and Hatai
L. proprius Yabe and Hatai	*L. hanawensis* Hayasaka
L. japonicus Yabe and Hatai	*L. pacificus* Hatai
L. orbicularis Yabe and Hatai	*L. morsei* Dall
L. suffussus Dall	*L. quadratus* Yabe and Hatai
L. kosibensis Hatai	*L. pallidus* sp. nov.

Among these species, none are definitely known to be common to both sides of the North Pacific Ocean, either as recent or as fossil. What the cause of this noteworthy difference is, in the number of species between the east and west sides of the North Pacific Ocean, is very hard to say, but however, one of the causes out of many, may be the necessity of further studies on the brachiopod fauna.

Pictothyris is a genus established by J. A. Thomson[4] in 1927, taking *Anomia picta* Dillwyn[5] as the genotype. This is a species confined in distribution to the present seas and Tertiary deposits of Japan. The genotype was described by J. A. Thomson in the following manner:—

"Shell fairly large, ovate, hinge-line curved, biconvex rectimarginate, test smooth, densely punctate. Beak moderate, suberect, foramen moderate, circular, permesothyrid, attrite, deltidial plates conjunct. Hinge-teeth strong, with greatly swollen bases, which appear to have arisen by the soldering of dental plates to the sides, widely grooved for the reception of the socket-ridges; ventral muscular impressions separated by a strong septal ridge. Cardinalia strong, buttressed by a short but stout unbifurcated median septum which fills the space between the bottom of the crural bases; the latter are fused laterally with the socket-ridges and rather swollen; cardinal process small but high, narrow at the base but expanded above, the posterior muscular striated area almost enclosed by the enfolding of two wings, and divided by a median ridge. Dorsal muscular impression on each side of the septum, deeply impressed. Loop long and reflected, descending branches not united to the septum, ascending branches united to the descending branches by interconnecting bands at the corners of the

4) J. A. Thomson: Brach. Morph. Gen., 260–262, fig. 86, 1927.
5) Dillwyn: Cat. Recent Shells, 1, 295, 1817.

transverse band, ribbon of loop narrow except the ventral part of the interconnecting bands."

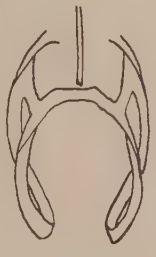
Several species are now known to belong to *Pictothyris,* and all are characterized by and agree with each other in the possession of the peculiar shaped cardinal process, cardinalia and advanced loop. In features such as the curvature of the beak towards to dorsal valve, shell outline, coloration, strength of the surface sculpture and curvature of the anterior and lateral commissures, certain variation exist. The variation just mentioned are within recognizable limits,—and are the basis of specific separation. Upon the characters just mentioned, the following species may be considered as valid, namely:—

Pictothyris picta (DILLWYN) — *Pictothyris hanzawai* YABE
P. elegans YABE and HATAI — *P. laquaeformis* YABE and HATAI

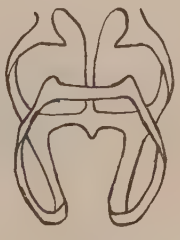
Of these species, none extend their living or fossil distribution outside of the present seas and Tertiary deposits of Japan. This restricted distribution and close relationship existing to the genus *Laqueus,* is suggestive of but not conclusive that *Pictothyris* is a localized gen derived from *Laqueus.*

Comparing the genera *Laqueus* with *Pictothyris,* it is readily recognized that the loop in the adult *Laqueus*[6] somewhat resembles that of *Terebratalia,* except for the ascending branches being united to the descending ones in the neighborhood of the transverse band by interconnecting bands. The descending branches like *Terebratalia* are united to the median septum by connecting bands. Now the genus *Pictothyris* possess a loop similar to that of *Laqueus,* differing in the

A. Showing the adult loop of *Laqueus. L. californicus*(KOCH), after T. DAVIDSON.



B. Showing the loop of *Pictothyris. P. picta*(DILLWYN). Adult specimen.



C. Showing the loop of *Terebratalia. T. coreanica*(ADAMS and REEVE). Adult specimen.

6) K. HATAI: Saito Ho-on Kai Mus., Res. Bull., X, 219–229, 41 figs., 1936.

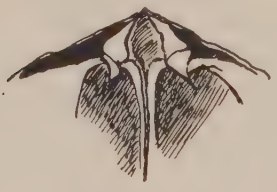
descending branches not being united to the median septum by connecting bands. The adult loop of both *Laqueus* and *Pictothyris* are constant and very reliable characters. The loops of these two genera are figured above for comparison, together with that of *Terebratalia*.

The above figures show that the adult stage in loop development of the three genera, *Laqueus, Pictothyris* and *Terebratalia* are similar in certain respects yet remarkably different in others. Since *Pictothyris* has absorbed the connecting bands from the descending branches to the median septum, it can be said to be in a more advanced loop stage than *Laqueus*. *Terebratalia* belongs to a different subfamily, and its discussions will be pursued at a latter date.

As to the cardinalia of these two genera, *Laqueus* and *Pictothyris*, J. W. JACKSON[7] in 1916 and H. YABE[8] in 1932, have contributed much knowledge. In regard to *Laqueus pictus* (=*Pictothyris picta*) and *Laqueus rubellus*, J. W. JACKSON once gave the following remarks:—

"*Laqueus pictus* (CHEM.) and *L. rubellus* (SOW.) possess obscure dental plates curving back to the apex of the valve. The hinge-plates in both are almost similar, consisting of two divergent buttresses rising from the floor of the valve and forming the dental socket and crural bases. In *L. pictus* these buttresses are divided clear to the apex, where a small bilobed cardinal process is present. In *L. rubellus* there is no cardinal process, the divaricator muscles being attached directly to the apical parts of the buttresses."

To make more clear to the readers the types of cardinalia and their chief points of difference in the two genera *Laqueus* and *Pictothyris*, the following figures are given.



D. Showing the type of cardinalia in *Laqueus*. *L. rubellus*(SOWERBY). Adult specimen: recent.

E. Showing the type of cardinalia in *Pictothyris*. *P. picta*(DILLWYN). Adult specimen: recent.

7) J. W. JACKSON: Geol. Mag., London, New Series, Dec. VI, 111, 23, 1916.
8) H. YABE: Sci. Rep. Tôhoku Imp. Univ., Ser. 2, XV (3), 193–197, 1 pl., 1932.

As can be seen from the figures of *Laqueus rubellus* (Sowerby), the cardinalia is characterized by having inner and outer hinge-plates separated by the crural bases; the inner hinge-plates rests on the posterior part of the median septum, and there is no cardinal process, but only a small striated area or pit over the umbo. However, in *Pictothyris picta* (Dillwyn), as can be seen from the above figures, the cardinalia is very strong, buttressed by a short and stout unbifurcated median septum, which fills the space beneath the bottom of the crural bases; there is no inner hinge-plate resting on the median septum, and the hinge-plates are entirely different from those of *Laqueus*.[9] The crural bases are fused laterally with the socket-ridges and rather swollen. Noteworthy is the presence of the peculiar shape cardinal process, which is not as large as some found in the genus *Terebratalia*, but is rather high; it is narrow at the basal part but expanded above, and the posterior striated area is almost enclosed by the enfolding of two wings, and divided by a median ridge.

Furthermore, difference between the two genera also exists in the hinge-teeth. In *Laqueus*, the hinge-teeth are supported by dental plates, which are recessive ventrally and the area between the shell wall is slightly calloused. However, in *Pictothyris*, the hinge-teeth are supported by much swollen bases, which appear to have arisen by the soldering of the dental plates to the shell wall, and there is no such marked area between the shell wall and dental plates as seen in *Laqueus*. Another feature of *Pictothyris*, is the presence of a wide groove for the reception of the socket-ridges. This groove is found at the inner posterior part of the swollen bases of the hinge-teeth. Therefore, it may be noticed that difference betwen *Laqueus* and *Pictothyris* is not slight.

In a former article,[10] the genera just mentioned were compared in the following table:—

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9) K. Hatai: Venus, VI (3), 153, pl. 5, figs. 15–18, 1936. K. Hatai: Rec. Ocean. Wk. Jap., VIII (1), 5, 1936.

10) K. Hatai: Bull. Biogeogr. Soc. Jap., VII (5), 57–60, 1937.

Laqueus	*Pictothyris*
Loop with connecting bands from the descending branches to the septum.	Loop without connecting bands from the descending branches to the septum.
Foramen slightly remigrant, telate.	Foramen circular, attrite.
Hinge-teeth supported by dental-plates; ventrally recessive, not soldered to the sides in aspect.	Hinge-teeth with greatly swollen bases, dental-plates soldered to sides, making base much swollen.
Cardinalia with outer and inner hinge-plates resting on median septum and separated by crural bases. Not divergent.	Cardinalia divergent, strong, buttressed by a short stout unbifurcated median septum filling space between bottom of socker-ridges. Not resting on median septum.
No cardinal process, merely striated area or pit over umbo.	Strong cardinal process, narrow at base, expanded above.
Distinct dental plates.	Obsolete dental plates.
Shell coarsely punctate(comparatively). Distribution: entirely around Japan including Hokkaidô, Karahuto, of both Pacific Ocean and Japan Sea.	Shell densely punctate(comparatively). Distribution: to Tyôsi Peninsula from Kyûsyû on the Pacific Ocean side, and from Kyûsyû to Wakasa Bay on the Japan Sea side.

Recently the geological ranges of the various species of Japanese Tertiary brachiopods, appeared,[11] in which those of the genera *Laqueus* and *Pictothyris* were also given. Regarding only the genera, it was then stated that *Laqueus* ranges from the Middle Miocene to recent, while *Pictothyris* ranges from the Lower Pliocene to recent (as the species recorded from the Middle Miocene is doubtful: it probably belonging to *Kamoica* Hatai, 1936). In fossil state, *Pictothyris* is not known from the region north of Bôsô Peninsula, Central Japan, while *Laqueus* has been recorded from regions far north of that Peninsula, viz., the northern end of Honsyû, the main island of Japan.

In living state, the geographic distribution of both *Laqueus* and *Pictothyris* appeared in two articles.[12–13] Summarizing those two articles, it is found that *Laqueus* is distributed in the seas surrounding Japan including Kyûsyû, north to Kamtchatka, and from the southeast Alaska Peninsula to California. At the present time there seems to be no record of *Laqueus* from the large area between Kamtchatka and Alaska Peninsula. *Pictothyris* has a limited area of distribution and can be said to be restricted to the regions south of and including Central Japan.

11) K. Hatai: Jap. Jour. Geol. Geogr., XIV, 53–65, 1937.
12) K. Hatai: Bull. Biogeogr. Soc. Jap., VI (8), 63–70, 1936.
13) K. Hatai: Bull. Biogeogr. Soc. Jap., VI (10), 75–95, 1936.

In regard to the relationship between Wakasa Bay, the northern limit of distribution of *Pictothyris* in the Japan Sea, to the region of Bôsô Peninsula, the northern limit of distribution in the Pacific Ocean, a short article has already appeared.[14] The distribution of *Pictothyris* and the oceanographical conditions governing its northernmost limit in distribution appear to be in good accordance. Aside from the relationship between distribution and oceanographical conditions, probably J. A. THOMSON,[15] was the only one to furnish some hint as to the relationship between *Laqueus* and *Pictothyris,* in the few words "more advanced loop." These few words in brachiopod morphology contain much meaning. From the fact that *Pictothyris* has a loop more advanced that *Laqueus* on the one hand and from the evidence found from the geographical and geological distributions on the other, it probably can be assumed, that *Laqueus* is the main stock of and *Pictothyris* is its branch.

In closing this short note, the writer wishes to offer his warmest thanks to Prof. H. YABE of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, not only for the permission to publish this note, but also for his kind advices during its preparation.

14) S. NOMURA and K. HATAI: Rec. Ocean. Wk. Jap., IX (1), 27–35, 1937.
15) J. A. THOMSON: Brach. Morph. Gen., 262, 1927.

Further Notes on the Brachiopoda Dredged by the Hukui-maru in Wakasa Bay, Hukui Prefecture, Japan

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(With 16 Tables)

In a previous article,[1] the recent brachiopods procured by dredge operation of the Hukui-maru, a surveying ship of the Hukui Prefectural Fisheries Station, under the command of Dr. Hirosi Nino of the Imperial Fisheries Institute of Tokyo, was dealt with. At that time dredge operation was made during the early part of December, 1935, from several stations in Wakasa bay, Hukui Prefecture.

During the first attempt of dredge operation and other oceanographical observations in the bay, Dr. Nino was unfortunately troubled by bad weather, which made oceanographical survey unsatisfactory and difficult. However, with use of the same surveying ship, he made two successful trips to sea, once in August and again in September of 1937.

The additional data on the oceanographical observations and newly procured specimens by dredge operation, now give the writer a fair knowledge of the brachiopod fauna of the bay, and also the general environmental conditions are also now fairly well judged. In the present article the writer hopes to throw additional light on some problems which have been facing him, and to make a comparison with the results of dredge operations of the surveying ships, Husa-maru from off Tiba Prefecture and of the Sitito-maru from off the southern end of Izu Peninsula in Sizuoka Prefecture.

Wakasa bay is one of the largest bays indenting the long coast line of the Japan Sea. It has a general trend of west to east with a

1) K. Hatai: A List of the Brachiopoda Dredged by the Hukui-maru from Wakasa Bay, Hukui Prefecture, Japan. *Venus*, VI (3), 146–154, 1, pl., 1936.

frontage of some 61 km., and the mouth faces to the north; from the mouth to the land end, the distance is about 22 km. M. Uda[2] has already given excellent figures showing the latitude and longitude, isobathymetrical lines and temperature distribution concerning Wakasa bay, and therefore, the hydrographical conditions are fairly well known. Also the additional data obtained by the three trips of Dr. Niino also throw further light on the conditions of the bay.

In the first attempt to dredge operation, Dr. Niino procured the following species of brachiopoda, from the following stations (both temperature and bottom material were not taken during the first attempt); the stations will be given first and the species later:—

Table 1.

Station number	North latitude	East longitude	Depth in meters
2	36° 11′ 51″	135° 12′ 12″	109
3	36° 12′ 18″	135° 43′ 12″	64
5	36° 13′ 20″	135° 42′ 12″	58
6	36° 14′ 02″	135° 46′ 06″	87
7	36° 15′ 14″	135° 45′ 18″	119
8	36° 14′ 14″	135° 44′ 36″	115
9	36° 13′ 36″	135° 43′ 36″	114
10	36° 13′ 03″	135° 42′ 36″	159
11	36° 12′ 24″	135° 41′ 48″	119
13	36° 11′ 36″	135° 44′ 02″	99
14	36° 12′ 12″	135° 45′ 00″	100

The second trip was successful from the standpoint of oceanographical observations, but brachiopods were collected only at the following stations:—

Table 2.

Station number	North latitude	East longitude	Depth in meters	Bottom temperature	Bottom material
1–3	36° 18′ 54″	136° 05′ 48″	88	18.1°C.	
6	36° 19′ 36″	136° 02′ 30″	98	16.5	
2–7	36° 17′ 16″	136° 04′ 24″	89	17.5	
2–8	36° 15′ 58″	136° 05′ 38″	73	19.8	Gravel, sand and mud

2) M. Uda: Hydrographical Investigations in the Seas Adjacent to Wakasa Bay. *Rec. Ocean. Wks. Jap.*, IV (2), 1–29, 5 tables, 21 text-figs., 1 pl., 1932.

From the collection of brachiopods as well as from the general results of oceanographical observations, probably the third trip was the most successful of all, and brachiopods were procured from the following stations:—

Table 3.

Station number	North latitude	East longitude	Depth in meters	Bottom temperature	Bottom material
3	35° 12′ 48″	135° 24′ 12″	77	22.4°C	Fine sand and shells
7	35° 57′ 30″	135° 21′ 24″	110	18.6	Sand and rocks
7′	35° 57′ 56″	135° 19′ 54″	116	18.6	Rocks
10	35° 53′ 06″	135° 15′ 36″	148	11.2	Sand and gravel
19	35° 50′ 36″	135° 13′ 18″	123	12.5	Rocks and sand
25	36° 50′ 18″	135° 20′ 06″	125	16.0	Gravel and mud
39	36° 43′ 12″	135° 27′ 00″	88	21.5	Gravel and sand
45	35° 54′ 06″	135° 19′ 24″	133	13.0	Rocks and gravel
46	35° 53′ 18″	135° 18′ 00″	236	3.0	Fine sand and shells

To the stations above listed, two of the surveying ship Sôyô-maru of the Imperial Fisheries Station may also be added, as follows:—

Table 4.

Station number	North latitude	East longitude	Depth in meters	Bottom temperature	Bottom material
541	35° 51′ 18″	135° 10′ 00″	150	7.3°C.	Sand
546	35° 48′ 30″	135° 15′ 35″	101	10.6	Sandy mud and gravel

The total number of distinguished species of brachiopods are given in the following table (Table 5), with the stations of their occurrence.

By summarizing the above tables, it is noticed that the largest number of species in regard to depth is as shown in the next table (Table 6). In the table, the depth ranges are divided into four classes for the sake of convenience and likewise the ranges of temperature are also thus divided.

The above table leaves out of consideration the number of individuals, which is a very important feature. However, from the table it is readily noticed that the largest number of species occurs in the depth-range of 109–159 meters, the second in abundance is in the range of 58–101, while at depths as great as 236 meters only a single species

Table 5.

	Table 1												Table 2				Table 3								
	2	3	5	6	7	8	9	10	11	13	14	13	6	27	28	3	7	7′	10	19	25	39	45	46
Campages basilanica DALL	×	×	×	×	×	×	×	–	–	×	×	–	–	–	–	–	×	–	–	–	–	–	–	–
C. japonica HATAI*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–
Craniscus japonicus (A. ADAMS)	×	–	×	×	×	×	×	×	–	–	–	–	–	–	–	–	×	×	–	–	–	–	×	–
Dallina raphaelis (DALL)	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–
D. elongata HATAI*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–
Laqueus quadratus YABE and HATAI	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–
L. rubellus (SOWERBY)	×	×	–	×	×	×	×	–	×	×	–	×	×	×	×	×	×	×	–	–	×	×	–	–
L. orbicularis YABE and HATAI	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	×	–	–	–	×	×
L. suffussus DALL	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Jolonica nipponica YABE and HATAI	–	–	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Nipponithyris nipponensis YABE and HATAI	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–
Pictothyris picta (DILLWYN)	–	–	–	–	–	–	–	–	–	×	×	×	–	–	–	–	–	–	–	–	–	–	–	–
Terebratalia coreanica (ADAMS and REEVE)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–
Terebratulina japonica (SOWERBY)	×	×	–	×	×	×	–	×	–	×	×	×	–	×	–	–	–	×	–	–	–	–	×	–
T. retusa (LINNAEUS)†	×	–	–	–	×	–	×	–	–	–	×	–	–	–	–	–	–	×	–	×	–	–	×	–

Table 6.

Range in depth (in meters)	58–101	109–125	133–159	236
Range in temperature (centigrade)	22.4–10.6	18.6–12.5	13.0–7·3	3.0
Total number of species	5	11	10	1

is found. These remarks hold good so far as the present data are concerned, but for other regions, probably a different arrangement may be found. Since the number of individuals from the depth of 236 meters was few, and those from the other depth-ranges very great, it

* To be described in a forthcoming article.

† This is a new species and will be described shortly.

appears evident that the largest number of individuals generally inhabit in Wakasa bay, a sea bottom shallower than 236 meters. This fact may hold good only for the present bay.

Among the species listed in Table 5, *Campages basilanica* DALL, *C. japonica* HATAI, *Jolonica nipponica* YABE and HATAI and *Pictothyris picta* (DILLWYN), are the typical members of warm water, and are an aid for correlating the conditions of the Japan Sea with that of the Pacific Ocean side of Japan.

In a former occasion,[3] the writer studied several species of brachiopods dredged by the surveying ship Sitito-maru of the Tokyo Fisheries Experimental Station, from among the small islets lying slightly south of Izu Peninsula, Sizuoka Prefecture, on the Pacific Ocean side of Central Japan.

The stations from where brachiopods were dredged are given in the following table.

Table 7.

Station number	North latitude	East longitude	Depth in meters	Bottom material
Dg. 3	33° 53′ 36″	138° 50′ 00″	107	Gravel, rocks and sand
Dg. 8	34° 08′ 00″	138° 52′ 00″	126	Rocks
Dg. 10	33° 53′ 06″	138° 56′ 36″	155	Rocks

The species dredged are the following ones, namely:—

Genus and species \ Station number	Dg. 3	Dg. 8	Dg. 10
Campages basilanica DALL	—	—	×
Craniscus japonicus (A. ADAMS) ...	—	—	×
Neohemithyris lucida (GOULD)	—	—	×
Jolonica nipponica YABE and HATAI	×	×	
Pictothyris picta (DILLWYN)	×	×	×
Terebratulina japonica (SOWERBY)	×	×	

The dredge operation of the surveying ship Sôyô-maru in the

3) K. HATAI: A List of the Brachiopoda Dredged by the Surveying Ship Sitito-maru of the Tokyo Fisheries Experimental Station in August 1935. *Bull. Biogeogr. Soc. Jap.*, VI (3), 143–146, 1936.

region of the above listed brachiopods of the Sitito-maru, yielded brachiopods from the following stations, namely:—

Table 8.

Station number	North latitude	East longitude	Depth in meters	Bottom temperature	Bottom material
255	34° 46′ 15″	139° 05′ 00″	263	13.5°C.	Gravel, muddy sand, shell
268	34° 30′ 30″	138° 59′ 10″	549	17.5	Gravel
269	34° 36′ 40″	139° 00′ 40″	247	11 2	Coral and gravel

From the shallow waters of the Pacific side of Bôsô Peninsula, Tiba Prefecture, Central Japan, the writer once[4] recorded several spcies of brachiopods. The brachiopods were dredged by the surveying ship Husa-maru of the Tiba Prefectural Fisheries Experimental Station at Tateyama-Hôzyô-mati, and are listed together with their stations of occurrence, and localities of the stations in table 9.

Genus and species \ Station number	20	11	45	83	85	53
Campages basilanica Dall	—	—	×			
Coptothyris grayi (Davidson)	—	—	×			
Craniscus japonicus (A. Adams)	—	—	×	—	×	
Dallina raphaelis (Dall)	—	—	×	—	×	
Hemithyris psittacea woodwardi (Adams)	—	—	×			
Jolonica nipponica Yabe and Hatai	—	×				
Laqueus pacificus Hatai	—	—	×			
L. quadratus Yabe and Hatai	—	—	—	—	×	
L. rubellus (Sowerby)	—	—	×	—	—	×
Pictothyris picta (Dillwyn)	×	—	—	×		
Terebratalia coreanica (Adams and Reeve)	—	—	—	×		
T. gouldii (Dall)	—	—	×			
Terebratulina japonica (Sowerby)	—	×	×	—	×	
T. pacifica Yabe and Hatai	—	—	×	—	×	

The localities of the above mentioned stations are given in table 9.

4) K. Hatai: A List of the Recent Brachiopoda Dredged from the Littoral Sea of the Pacific Side of Bôsô Peninsula, Central Japan. *Rec. Ocean. Wks. Jap.*, VIII (1), 1–16, 1936.

Table 9.

Station number	Locality on the Pacific Ocean side of Bôsô Peninsula, Tiba Prefecture	Depth in meters
11	south of Osima	16.4
20	off Inuwaka at the northern end	28
45	off Arakawa at the central part	23
53	off Kuriyama-gawa at the central part ..	130
83	off Hiranosinden at the central part	49–58
85	off Katu-ura near the southern part	130–148

From the same sea area, the surveying ship Sôyô-maru has procured brachiopods from the stations given in table 10.

Table 10.

Station number	North latitude	East longitude	Depth in meters	Bottom temperature	Bottom material
1	34° 52′ 40″	139° 42′ 50″	426	10.6°C.	Rocks
2	34° 49′ 40″	139° 51′ 40″	176	—	Rocks
4	34° 57′ 30″	140° 06′ 00″	287	10.0	Sand
5	35° 03′ 00″	140° 16′ 20″	269	10.0	Sandy mud

The species from the four stations of the Sôyô-maru are given in the following list, namely:—

Genus and species \ Station numbers	1	2	4	5
Craniscus japonicus (A. Adams)	—	—	—	×
Dallina raphaelis (Dall)	—	—	—	×
Hemithyris psittacea woodwardi (A. Adams)	—	—	—	×
Laqueus blanfordi (Dunker)	×	×		
L. rubellus (Sowerby)	—	—	×	×

Before making a comparison of the brachiopod fauna of Wakasa bay with those of Izu and Bôsô, a summarized account of the species from the latter two localities are given in the following table 11. In the table the species and their respective stations are given.

By summarizing tables 7–10, it is noticed that the largest number of species in regard to depth is as shown in the next table (Table 12). In the table, the depth-ranges are divided into four classes for the sake

Table 11.

Genus and species \ Station number	Table 7			Table 8			Table 9						Table 10			
	3	8	10	255	268	269	11	20	45	53	83	85	1	2	4	5
Campages basilanica DALL	–	–	×	–	–	–	–	–	×							
Coptothyris grayi (DAVIDSON)	–	–	×	–	–	–	–	–	×							
Craniscus japonicus (A. ADAMS)	–	–	–	–	–	×	–	–	×	–	–	×	–	–	–	×
Dallina raphaelis (DALL)	–	–	–	–	–	–	–	–	×	–	–	×	–	–	–	×
Hemithyris psittacea woodwardi (A. ADAMS)	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	×
Jolonica nipponica YABE and HATAI	×	×	–	–	–	–	×									
Laqueus blanfordi (DUNKER)	–	–	–	–	×	–	–	–	–	–	–	–	×	×		
L. quadratus YABE and HATAI	–	–	–	–	–	–	–	–	–	–	–	×				
L. pacificus HATAI	–	–	–	–	–	–	–	–	×							
L. rubellus (SOWERBY)	–	–	–	×	–	–	–	–	×	×	–	–	–	–	×	×
Neohemithyris lucida (GOULD)	–	–	×													
Pictothyris picta (DILLWYN)	×	×	×	–	–	–	–	×	–	–	×					
Terebratalia coreanica (ADAMS and REEVE)	–	–	–	–	–	×	–	–	–	–	×					
T. gouldii (DALL)	–	–	–	–	–	–	–	–	×							
Terebratulina japonica (SOWERBY)	×	×	–	–	–	–	×	–	×	–	–	×				
T. pacifica YABE and HATAI	–	–	–	–	–	×	–	–	×							
Total number from each station	2	2	3	1	1	3	2	1	10	1	2	4	1	1	1	4

of convenience, and unfortunately the ranges of temperature are known for only two of the four classes.

Table 12.

Range in depth (in meters)	16–58	107–176	247–287	426–549
Range in temperature (centigrade)			13.5–10.0	17.5–10.6
Total number of species	12	8	5	1

The above table leaves out of consideration the number of individuals, which is a very important feature. However, it may be noticed that the largest number of species occurs in the depth-range of 16–58 meters, and gradually decreases with the increase of depth. The above figures hold good for the sea area of Izu and Bôsô, so far as the present data are concerned. But, a comparison of the above figures with those of Wakasa bay, may be in need of explanations.

Rearranging the figures of Wakasa bay in order to make a comparison with those given in table 12, the following is reached.

Table 13.

Depth-range (Izu-Bôsô)	16–58		107–176	247–287	426–549
Depth-range (Wakasa bay)		58–101	109–159	236	
Temperature-range (Izu-Bôsô)				13.5–10.0	17.5–10.6
Temperature-range (Wakasa bay) .		22.4–10.6	18.6–7.3	3 0	
Number of species (Izu-Bôsô)	13		8	5	1
Number of species (Wakasa bay) ..		5	15	1	

Comparing the figures for Izu-Bôsô with that for Wakasa bay, considerable differences are noticed, in the temperature, number of species and in depth. Explanations for the differences shown in the above table are found in 1) differences in depths of dredge operation, 2) differences in temperature according to depth, 3) differences in water current, and 4) difference in bottom configuration and bottom material. The differences are really not so great as given in the above table, since both Izu and Bôsô are taken as a single unit in the above table. Therefore, by considering Izu and Bôsô as independent or as separate units, the differences are much decreased as shown in the following table.

Table 14.

Depth-range (Izu)			107–155	247–		549
Depth-range (Bôsô)	16–58		130–147	269–287	426	
Depth-range (Wakasa)		58–101	109–159	236		
Number of species (Izu)			5	4		1
Number of species (Bôsô) ..	13		4	4	1	
Number of species (Wakasa)		5	15	1		

Since dredge operation in Wakasa bay includes four localities, each is given separately with the number of species in brackets, in order to give accurate results.

Table 15.

Depth-range (1)	58–101 (5)	109–159 (12)	
Depth-range (2)	73– 98 (3)		
Depth-range (3)	77– 88 (1)	110–148 (13)	236 (1)
Depth-range (4)		101–150 (2)	

From the foregoing tables there seems to exist two important life zones, one in the depth-range of 16–58 meters and the other in the depth-range of 107–159 meters, so far as the given data are concerned. However, until dredge operation has been progressed to an extent that we may know the conditions of fauna from the strand line down to about 300 meters or more, we can not expect to draw life zones. Particularly to be emphasized at this place that even if life zones are to be made, the kind of fauna that should be used are those which are not liable to be easily carried from one place to another. Probably more than two important life zones will be found with overlapping areas, by future dredge operation.

The species of brachiopods common and not common to the three regions so far dealt with, are the following.

Table 16.

Genus and species \ Localities	Wakasa Bay			Izu	Bōsō	Chronological distribution
	1	2	3			
Campages basilanica DALL	×	—	×	×	×	Recent
C. japonica HATAI*	—	—	×			Recent
Coptothyris grayi (DAVIDSON)	—	—	—	×	×	Miocene-recent
Craniscus japonicus (A. ADAMS)	×	—	×	×	×	Miocene-recent
Dallina elongata HATAI*	—	—	×			Recent
D. raphaelis (DALL)	×	—	×	—	×	Miocene-recent
Hemithyris psittacea woodwardi (A. ADAMS)	—	—	—	—	×	Miocene-recent
Jolonica nipponica YABE and HATAI	×	—	—	×	×	Pleistocene-rec.
Laqueus blanfordi (DUNKER)	—	—	—	×	×	Pliocene-recent
L. pacificus HATAI	—	—	—	—	×	Recent
L. quadratus YABE and HATAI	×	—	×	—	×	Pliocene-recent
L. rubellus (SOWERBY)	×	×	×	×	×	Miocene-recent
Neohemithyris lucida (GOULD)	—	—	—	×		Pleistocene-rec.
Pictothyris picta (DILLWYN)	×	×	—	×	×	Pliocene-recent
Terebratalia coreanica (ADAMS and REEVE)	—	—	×	×	×	Miocene-recent
T. gouldii (DALL)	—	—	—	—	×	Miocene-recent
Terebratulina japonica (SOWERBY)	×	×	×	×	×	Miocene-recent
T. pacifica YABE and HATAI	—	—	—	×	×	Recent
T. retusa (LINNAEUS)	×	—	×			Miocene-recent
Laqueus orbicularis YABE and HATAI	—	—	×			Pliocene-recent
L. suffusus DALL	×					Recent
Nipponithyris nipponensis YABE and HATAI	×	—	×			Pliocene-recent
Total number of species for each locality	11	3	12	11	15	

The above table clearly shows that several marked differences are found in the distribution of the brachiopods between the given regions. For example, *Campages japonica* HATAI, *Dallina elongata* HATAI, *Laqueus suffusus* DALL, *L. orbicularis* YABE and HATAI, *Nipponithyris nipponensis* YABE and HATAI, and *Terebratulina retusa* (LINNAEUS)[5] occur in Wakasa bay, yet are at present not found from the waters of south Izu and Bôsô Peninsulas. Further, *Hemithyris psittacea woodwardi* (A. ADAMS), *Laqueus blanfordi* (DUNKER), *L. pacificus* HATAI, *Neohemithyris lucida* (GOULD), *Terebratalia gouldii* (DALL), and *Terebratulina pacifica* YABE and HATAI, which occur in the regions of Izu and Bôsô, are not found from the waters of Wakasa bay.[6]

Outstanding differences in the distribution of the brachiopods just mentioned is not a rare case, because should the marine molluscs be studied, a similar result would be obtained. By comparing the faunal lists given by T. KURODA[7] for Wakasa bay (Hukui Prefecture) and by S. NOMURA[8] for Sagami bay (Zusi), it may be noticed that results similar to the case of the brachiopods will be obtained.

Now with the differences and common features of the marine molluscs and brachiopods of the three regions known, the question arises as to how we may correlate these regions in a method which may be employed in studying fossils of the same animal groups which occurs in the Neogene deposits of Japan. This question is still in need of further studies and more data in order that we may bring forth reasonable explanations.

5) What was previously reported as *Terebratulina retusa* (LINNAEUS), is a new species and will shortly be published.

6) T. KURODA has recorded *Coptothyris grayi* (DAVIDSON), from Wakasa Bay. Catalogue of the Mollusca of Hukui-ken, p. 205, 1933.

7) T. KURODA: Catalogue of the Mollusca of Hukui-ken, 169–205, 1933.

8) S. NOMURA: Additional Pyramidellidae from Siogama Bay, with Remarks on the molluscan Fauna, Especially Pyramidellidae from Sagami Bay; being a Comparative-Study. *Saito Ho-on Kai Mus., Res. Bull.*, XIII, 32–44, 1937.

Chaetognaths Collected Chiefly from the Bays of Sagami and Suruga, with Some Notes on the Shape and Structure of the Seminal Vesicle

By

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(With 4 Plates and 10 Text-figures)

The material for this study consists of more than ten thousand specimens. Most of them were collected in Sagami and Suruga Bays from April 1936 to March 1937, chiefly from the surface (0–10 m), but some from the deeper waters down to 1000 m. Besides this material, some specimens which came from other localities are included. Thus in all twenty-two species including two new ones are represented.

This study was accomplished while I was a research member of the Mitsui Institute of Marine Biology. I am very grateful to the authorities of the institute for the grant of the seat in the institute. I am indebted to Prof. T. Komai for his great help and constant encouragement offered to this work. To Prof. T. Aida I owe many kind advices, and loan of literature and sketches. For collecting the material, I received generous assistance from Messrs. H. & Y. Tanaka and T. Suzuki of the Mitsui Institute of Marine Biology. To all these gentlemen I express here my hearty thanks.

I. Descriptions of species

(1) *Sagitta hexaptera* d'Orbigny, 1834–1844 (Pl. III, fig. 1)

Sagitta bipunctata, Krohn, 1853.

Sagitta hexaptera + *Sagitta tricuspidata* + *Sagitta magna*, Hertwig, 1880.

Sagitta bipunctata + *Sagitta magna*, Langerhans, 1880.

Spadella hexaptera + *Spadella tricuspidata* + *Spadella magna* + *Sagitta darwini*, Grassi, 1883.

Sagitta hexaptera, Strodtmann, 1892, 1905; Conant, 1896; Aida, 1897; Krumbach, 1903; Fowler, 1906; Moltschanoff, 1907; Ritter-Záhony, 1910, 1911 a, b, c; Michael, 1911, 1919; Germain & Joubin, 1916; Johnston & Taylor, 1921; Bollmann, 1934; Fraser, 1937.

Sagitta tricuspidata, Doncaster, 1903.
Sagitta fowleri, Benham, 1912.

This species is not very abundant.

(2) *Sagitta lyra* Krohn, 1853 (Fig. 1; Pl. III, fig. 2)

Sagitta lyra, Krohn, 1853; Hertwig, 1880; Strodtmann, 1892; Aida, 1897; Michael, 1911; Germain & Joubin, 1916; Johnston & Taylor, 1921.
Sagitta lyra + *Sagitta gazellae*, Ritter-Záhony, 1911 a, b, c, 1914; Bollmann, 1934.
Spadella lyra, Grassi, 1883.
Sagitta furcata, Steinhaus, 1896; Krumbach, 1903; Fowler, 1905, 1906.
Sagitta whartoni, Fowler, 1896; Strodtmann, 1905.
Pseudosagitta grimaldii, Germain & Joubin, 1912.
(? *Sagitta maxima*, *Sagitta magna*.)

A common species. I agree with Johnston and Taylor in considering *Sag. gazellae* Ritter-Záhony as a synonym of *Sag. lyra* Krohn, the two representing two extremities of variation within the same species. These two types differ from each other merely in the thickness of the connecting band between the anterior and posterior fins and in the form of the ventral column of hooks. In other points, such as the shape of the corona ciliata, the situation and appearance of the seminal vesicle, they conform with each other exactly. The differences alleged by Ritter-Záhony as found in the length of the tail segment and in the number of hooks and teeth between the types seem to be of no specific value as Johnston and Taylor have already pointed out.

The connecting band between the anterior and posterior fins is very remarkable in the "*lyra*"-type, but it is very thin or entirely absent in the "*gazellae*"-type. In the latter, the ventral column of the hook is of the form found in many other common *Sagittae*, while in the former, the basal portion of the edge of the shaft often protrudes prominently beyond the general contour of the ventral column. These two characteristics are, however, continuous without any sharp demarcation. Moreover, there are found very frequently, individuals having connecting bands and hooks of "*gazellae*"-type, or having the hooks of "*lyra*"-type and without any connecting band.

It is worthy of notice that the individuals of the typical "*lyra*"-form among the present material having the body length 31–41 mm are mature, whereas those of "*gazellae*"-form of the same size are still immature. In the former, the body is rather bulky as compared with the latter; and the cephalic armatures are reduced considerably as

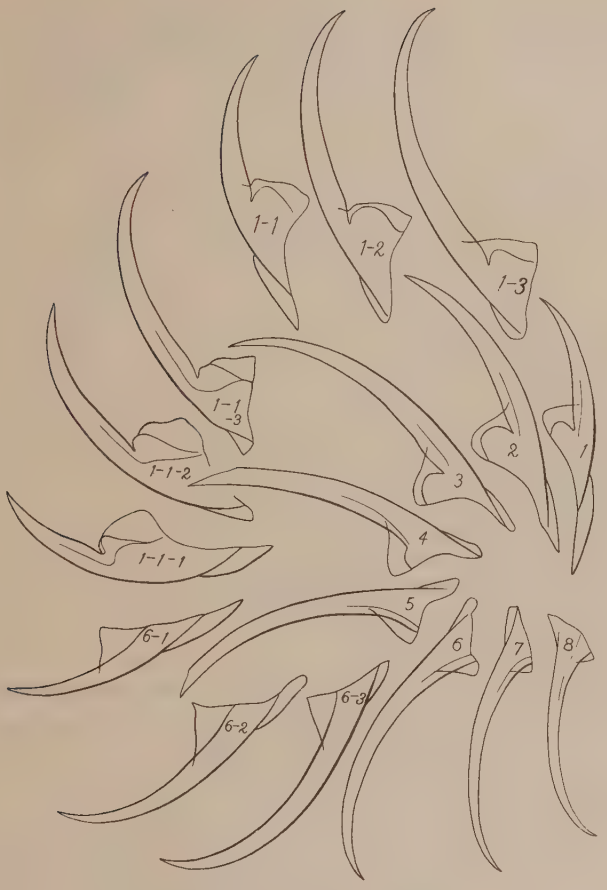

Fig. 1. *Sag. lyra;* Hooks.

1–8, hooks of 33.5 mm individual without connecting band; (1–1)–(1–3), anterior three hooks of 39 mm individual with thin connecting band; (1–1–1)–(1–1–3), hooks of 25.7 mm individual with thick connecting band; (6–1)–(6–3), anterior three hooks of 37 mm individual with thick connecting band. ×35.

shown in the next table.

Body length in mm	Tail segment in %	Hooks	Anterior teeth	Posterior teeth
25.7	19.1	3–3	8	5
33	18.2	2–3	8	4
35	17.4	3–3	8	3–4
41	17.1	3–3	7	2
41	17.1	3–3	9–10	2–3

The fact that there is no parallelism between the body length and the maturity is known in deep sea chaetognaths such as *Eukr. hamata* and *Sag. planctonis*. The bulky appearance of the mature "*lyra*"-form may be due to its voluminous ovarian ova. The reduction of the cephalic armatures to a greater or smaller degree in mature individuals is known in *Sag. planctonis* and *Sag. hexaptera* also.

(3) *Sagitta enflata* Grassi, 1881
(Figs. 7–*1*; Pl. III, fig. 3; Pl. IV, figs. 9–10)

? *Sagitta lyra*, Langerhans, 1880.
Spadella enflata, Grassi, 1883.
Sagitta enflata, Strodtmann, 1892; Béraneck, 1895–6; Aida, 1897; Krumbach, 1903; Fowler, 1906; Michael, 1911, 1919; Ritter-Záhony, 1911 a, b, c; Bollmann, 1934.
Sagitta enflata + *Sagitta gardineri* + *Sagitta flaccida*, Doncaster, 1903.
Sagitta brachicephala, Moltschanoff, 1907.
Sagitta australis, Johnston, 1909.
Sagitta enflata forma *typica*, Ritter-Záhony, 1910.
Sagitta inflata, Germain & Joubin, 1916.
Sagitta enflata + *Sagitta australis*, Johnston & Taylor, 1919.
Sagitta enflata + *Sagitta gardineri*, John, 1933.
Sagitta gardineri, Lele & Gae, 1936.

This species is one of the commonest chaetognaths in this region.

(4) *Sagitta bipunctata* Quoy et Gaimard, 1827
(Pl. III, fig. 8)

Sagitta multidentata, Krohn, 1853.
Sagitta bipunctata, Hertwig, 1880; Strodtmann, 1892, 1905; Krumbach, 1903; Fowler, 1905; Michael, 1911; Ritter-Záhony, 1911 a, b, c; Germain & Joubin, 1916; Johnston & Taylor, 1919; Burfield, 1927; Bollmann, 1934.
Spadella bipunctata, Grassi, 1883.
Sagitta bipunctata forma *typica*, Ritter-Záhony, 1910 b.

This species occurs frequently, though not very abundant.

(5) *Sagitta bedoti* Béraneck, 1895
(Figs. 5–*1*, *2*; Fig. 6–*1*; Figs. 7–*2*, *3*; Pl. IV, figs. 11–12)

Sagitta bipunctata, Aida, 1897.
Sagitta bedoti, Béraneck, 1895–6; Fowler, 1906; Ritter-Záhony, 1911 a, c; Johnston & Taylor, 1911; Michael, 1919; Lele & Gae, 1936.
Sagitta polyodon, Doncaster, 1903.

One of the commonest species, occupying 16% of the whole collection.

(6) *Sagitta pulchra* Doncaster, 1903 (Pl. III, fig. 4)

Sagitta pulchra, Doncaster, 1903; Fowler, 1906; Ritter-Záhony, 1911 a, c; Johnston & Taylor, 1919; Michael, 1919.
Sagitta weberi, Oye, 1918.

A rare species.

(7) *Sagitta robusta* Doncaster, 1903 (Fig. 9–*1*; Pl. IV, figs. 1–8)

Sagitta hispida, Aida, 1897.
Sagitta robusta + *Sagitta ferox*, Doncaster, 1903.
Sagitta japonica, Galzow, 1909.
Sagitta robusta, Fowler, 1906; Ritter-Záhony, 1910, 1911 a, b, c; Johnston & Taylor, 1919; John, 1933.

(8) *Sagitta ai* n. sp. (Pl. I)

Mature individuals 16–19.5 mm in length, with tail segment reaching 26.3–30.4% of body length. Body very sturdy, being widest between the caudal end of anterior fin and front end of posterior fin. Lateral field narrow; muscles developed very well. Head very large, broader than the widest portion of body. Neck evident, though obscured by a collarette which is fairly conspicuous and extends posteriorly as far as corona ciliata. No constriction at tail septum.

Anterior fin elongated, beginning on the level of the middle of ventral ganglion, and broader in caudal portion. No rayless zone. Posterior fin rounded-triangular, and as long as anterior fin, being broadest behind tail septum and lying more on tail segment than on trunk. Narrow inner rayless zone present in front of tail septum. Tail fin triangular.

Eye-pigment apparently reniform. Corona ciliata begins just behind the brain and stretches posteriorly twice the head length, without any conspicuous wave, though marked with a sinus between eyes. A specimen has the corona ciliata interrupted at the sinus between eyes, and is divided into a shorter anterior and a longer posterior half, like the specimen of *Sag. hispida* described by Doncaster (1903) and also those of *Sag. robusta* and *Sag. pulchra* reported by Ritter-Záhony (1911 a). Diverticula at the beginning of intestine present, though less remarkable than in *Sag. robusta*.

Hooks usually 6; anterior teeth 7–10 in many specimens, teeth rows meet each other in an acute angle; posterior teeth 11–15. Point of hook somewhat blunt; shaft very broad, without denticulation along edge and brown in colour. Vestibular ridge with many small papillae;

notch reaches 2nd–5th tooth; 0–2 teeth out of the wing.

Ovary extending anteriorly to neck. Seminal receptacle opening on a small papilla. Seminal vesicle in contact with both posterior and tail fins, elongated, slightly larger in anterior portion (head), which is not so conspicuous as in *Sag. robusta.* The vesicle bursts usually along the lateral side of head by a fissure which may reach more posteriorly in some specimens.

Formula:

Body length in mm	Tail segment in %	Hooks	Anterior teeth	Posterior teeth
11.2–12.5	28.6–30 4	6–8	8–9	11–13
13 –14	26.9–28.6	6–6	8–9	12–12
14.5 (2)	27.6	6–6	7–8	11–14
15 (2)	30.0	6–6	8–10	11–12
15 (2)	26.7–28.0	6–6	9–9	11–14
16 (2)	26.3–28.1	5–6	8–8	14–15
16.5 (2)	27.2	6–7	9–12	12–15
17 (2)	26.5–28.2	6–7	8–10	11–14
17 (2)	26.4–28.2	6–7	7–8	13–15
17.5–19.5	27.5–28.6	6–6	8–8	13–14

Remarks: This species is related most closely with *Sag. robusta,* but there are many points of difference as follows:

	Sag. robusta	*Sag. ai*
1) Length of mature individuals	10–13.5 mm; the ovary quite ripened, fills up the body cavity nearly completely. The seminal vesicle is in the maximum size.	16–19.5 mm In 10–13.5 mm individuals the ovary is not yet matured, scarcely reaching the ventral ganglion. The seminal vesicle is still rudimentary.
2) Head	Large.	Comparatively larger than that of *Sagitta robusta.*
3) Collarette	Continues posteriorly to the seminal vesicle, though its thickness decreases much in the range between the ventral ganglion and the position slightly in front of the seminal vesicle, where it fairly swells again.	It is confined to the range in front of the level of the posterior end of corona ciliata.
4) Corona ciliata	Head length ×2½. Somewhat wavy in its appearance.	Head length ×2; not sinuous.
5) Seminal vesicle	It consists of a large round head and a narrow trunk; the burst always occurs along the ventro-lateral side of the head.	Head is inconspicuous.

It is possible that *Sag. ferox* DONCASTER reported by FOWLER (1906) from the Siboga-Area is identical with the present species, though there are some differences in the shape of the seminal vesicle, collarette and in some other minute characters. However, *Sagitta ferox* described originally by DONCASTER seems to be not quite identical with the same species reported by FOWLER, since there is no characteristic common to both forms, except for the number of hooks.

Of other sturdy species, *Sag. planctonis* is much larger than the present specimens; moreover the two forms differs distinctly in the corona ciliata and the situation of the seminal vesicle.

The present form is fished from the surface waters mingled with *Sag. robusta*, with no intermediate form being found; the former is much fewer than the latter.

(9) *Sagitta serratodentata* KROHN, 1853
(Figs. 5–*3*, 6–*2*, 10; Pl. IV, figs. 14–16)

Sagitta serrato-dentata, KROHN, 1853; HERTWIG, 1880; LANGERHANS, 1880.
Spadella serratodentata, GRASSI, 1883.
Sagitta serratodentata, STRODTMANN, 1892, 1905; BÉRANECK, 1895–6; AIDA, 1897; DONCASTER, 1903; KRUMBACH, 1903; FOWLER, 1905, 1906; RITTER-ZÁHONY, 1910, 1911 a, b, c; MICHAEL, 1911, 1919; GERMAIN & JOUBIN, 1916; JOHNSTON & TAYLOR, 1919, 1921; BOLLMANN, 1934; FRASER, 1937.

Remarks: The Japanese forms show the formula somewhat differing from the European and Indian forms as follows:

Body length in mm	Tail segment in %	Hooks	Anterior teeth	Posterior teeth
11.1–11.2	23.2–25.2	5–6	7–11	16–20
11.3–11.5	22 6–26.5	5–6	8–10	20–25
12 (2)	25 0–25.8	5–6	8–9	18–20
12.3–12.5	25.6–27 7	6–6	11–12	20–23
12.5–12.6	23.8–24.0	4–6	10–10	20–21
12.6 (2)	24.6–26.2	6–6	8–10	18–21
12.7–12.8	23.6–24.2	5–6	10–11	21–21
12.9 (2)	23.3–25.6	6–6	10–11	22–23
13 –13.5	23.1–25.9	5–7	11–11	20–21
13.6–14	25.7	6–7	11–13	23–24

The seminal vesicle of Japanese specimens differs in shape from that of any form ever described, as mentioned later on.

(10) *Sagitta pseudoserratodentata* n. sp. (Pl. II)

Mature individuals 7–9 mm in length, with tail segment reaching

25.9–31.6% of body length. Body somewhat transparent and not very sturdy, nearly of uniform width, but slightly wider in the part between anterior and posterior fins. Lateral field comparatively large, muscles rather feeble. Neck inconspicuous. Faint collarette occurs around neck, though usually hard to recognize. No constriction at tail septum.

Anterior fin begins just behind ventral ganglion, elongated and taller in posterior portion, without any rayless zone. Posterior fin larger than anterior fin and rounded in shape, being broadest behind tail septum and more than half of its length lying on tail segment. Anterior portion and inner zone in front of tail septum are rayless. Tail fin triangular as in other forms.

Eye-pigment rather small and apparently elongated. Corona ciliata long, about twice as long as head; it begins behind eyes and has three sinuses on lateral margin. Diverticula at the beginning of intestine absent.

Hooks 6–7, anterior teeth 4–6, posterior teeth 10–12 in many individuals. Point of hook sharp; shaft serrated along its edge as in *Sag. serratodentata*. Vestibular ridge with several inconspicuous low papillae. Notch reaches 2nd–4th tooth, and 0–2 teeth are out of the wing.

Ovary extends anteriorly near ventral ganglion. Seminal receptacle opens on a small papilla. Seminal vesicle situated near the caudal end of posterior fin, at a short distance from it and at a much longer distance from tail fin, and strongly projected laterally; the antero-lateral corner forms a finger-shaped protuberance. When mature, the vesicle bursts along its lateral side behind the process.

Formula:

Body length in mm	Tail segment in %	Hooks	Anterior teeth	Posterior teeth
6.5–6.7	26.9–29.2	7–8	6–7	10–14
6.7–6.8	27.9–28.4	6–7	4–4	7–9
6.8–7.1	29.4–29.6	6–7	5–6	10–12
7.1–7.2	26.8–29.2	6–7	5–6	12–13
7.5 (2)	26.7	6–7	6–6	10–12
7.6–7.8	27.6–28.2	6–7	6–6	12–12
7.9–8	30.0–31.6	5–6	5	11–12
8 (2)	26.3–28.8	6–6	4–4	10–13
8 –8.2	28.0–30.0	6–7	6–8	10–15
8.5–9	25.9–31.1	6–6	5–6	12–12

Remarks: This species shares with *Sag. serratodentata* the serrated hooks, small elongated eye pigment and the inconspicuous collarette, but it is separated distinctly from the latter by: 1) the smaller size of mature individuals (12–14 mm in the latter), 2) fewer anterior and posterior teeth, 3) corona ciliata beginning behind the eyes (in *Sag. serratodentata* it begins just behind the brain), 4) difference in shape of seminal vesicle (the seminal vesicle of *Sag. serratodentata* is oval in shape, with thickened frothy tissue at the anterior end and several chitinous teeth along its antero-lateral margin).

106 individuals were fished from the surface waters off Susaki, mingled with other common species.

Aida (1897), the discoverer of this form, mentions in Dôbutsugaku Zasshi* (Vol. IX, p. 127, in Japanese) that, "there are two, large and small, forms among the specimens of *Sag. serratodentata* collected from the Japanese waters." He also describes the shape of the seminal vesicle of this species.

(11) *Sagitta neglecta* Aida, 1897
(Figs. 8–*1*; Pl. IV, fig. 13)

? *Sagitta bipunctata*, Béraneck, 1895–6.
Sagitta neglecta, Aida, 1897; Fowler, 1906; Michael, 1911, 1919; Ritter-Záhony, 1911 a, c; Germain & Joubin, 1916; Johnston & Taylor, 1919, 1921; John, 1933.
Sagitta septata, Doncaster, 1903.
? *Sagitta trichodermis*, Oye, 1918.

(12) *Sagitta regularis* Aida, 1897 (Fig. 8–*2*)

Sagitta regularis, Aida, 1897; Fowler, 1906; Ritter-Záhony, 1911 a, c; Johnston & Taylor, 1919.
Sagitta regularis + *Sagitta bedofordii*, Doncaster, 1903.
? *Sagitta longicauda*, Galzow, 1909.
? *Sagitta pseudoregularis*, Oye, 1918.

Both *Sag. neglecta* and *Sag. regularis* are commonly fished from the surface waters of this region.

Remarks: *Sagitta trichodermis* Oye and *Sagitta neglecta* differ from each other merely in the situation and outline of the corona ciliata; the same is true as for *Sagitta pseudoregularis* Oye and *Sagitta regularis*. Oye (1918) describes the corona ciliata of *Sagitta trichodermis* and *Sagitta pseudoregularis* as confined to the head, extending from the brain to the neck. It is roughly elongate-elliptical in shape,

* Zoological Magazine.

and slightly depressed between eyes. Of other species, only *Sag. enflata, Sag. hexaptera* and *Sag. lyra* have the corona ciliata confined to the head. In these species, the anterior portion of the corona ciliata is usually in contact with eyes. The corona of Oye's species appears to be of a new type.

However, it is to be noticed that the corona ciliata of his species is exactly the same in outline as that of the pharynx. The corona of *Sagitta weberi* and that of *Sagitta parva* described by the same author seem to be correct, but his descriptions and figures of the corona of *Sag. trichodermis, Sag. pseudoregularis* and *Krohnitta kerberti* seem to be based on imperfect and transparent specimens in glycerin. I have tried his method of observation on my Japanese specimens and found that the correct outline of the corona ciliata can be observed in good specimens which retain the corona perfectly, but in poorly preserved specimens only the outline of the pharynx can be detected. Since good specimens must have the corona and sensory spots intact, a microscopical examination is indispensable for the evaluation of specimens.

Likewise, the figures of the alleged corona ciliata of *Sag. enflata* and *Sag. planctonis* given by Michael (1911) seem to be of the pharynx. All my descriptions and figures are based on perfect and opaque specimens stained with alum-carmin (Aida's method).

(13) *Sagitta minima* Grassi, 1881 (Pl. III, fig. 5)

Spadella minima, Grassi, 1883.
Sagitta minima, Strodtmann, 1892; Aida, 1897; Doncaster, 1903; Krumbach, 1903; Ritter-Záhony, 1911 a, c; Germain & Joubin, 1916; Johnston & Taylor, 1919; Michael, 1919; Bollmann, 1934.

A common species, occupying 9% of the whole collection.

(14) *Sagitta decipiens* Fowler, 1905 (Fig. 9–*2*, Pl. III, fig. 6)

Sagitta decipiens, Fowler, 1905; Ritter-Záhony, 1911 a, b, c; Bollmann, 1934.
Sagitta sibogae, Fowler, 1906.
Sagitta decipiens+*Sagitta philippini,* Michael, 1919.

Rare species. *Sag. philippini* created by Michael (1919) seems to be synonymous with *Sag. decipiens* as she admits. The fact that differences found between the two forms in the collarette, rayless area of the posterior fin, hooks, and in the length of the ovary are apparently of no specific value, being merely of the nature of individual variation, is clearly seen in the present specimens.

(15) *Sagitta macrocephala* Fowler, 1905

Sagitta macrocephala, Fowler, 1905, 1906; Ritter-Záhony, 1911 a, b, 1914; Germain & Joubin, 1916; Michael, 1919; Johnston & Taylor, 1921; Bollmann, 1934.

Only 13 specimens were collected from Suruga Bay and Sagami Bay. They were found in hauls obtained by an open net drawn from 1000 m to surface. In hauls from 200–0 m at the same station, this species was not found.

The intestine of the living animal was coloured red as in *Eukr. hamata*. In the eye, no central and surrounding areas are differentiated. The seminal vesicle is situated just behind the posterior fin widely apart from the tail fin.

(16) *Sagitta planctonis* Steinhaus, 1896 (Fig. 2)

Sagitta planctonis, Steinhaus, 1896; Ritter-Záhony, 1911 a, b, 1914; Michael, 1911, 1919; Germain & Joubin, 1916; Johnston & Taylor, 1921; Bollmann, 1934.
Sagitta planctonis + *Sagitta zetesios*, Fowler, 1905, 1906.

Rare species. Only 13 specimens are in my hand. They were all fished from the depths of Sagami and Suruga Bays. In the present specimens, the seminal vesicle, or rather the vestige of the ruptured vesicle (Fig. 2 A), is situated just behind the posterior fin considerably apart from the tail fin. In this point, the specimens differ from the descriptions of previous authors, and resemble rather *Sag. zetesios* reported by Fowler (1905, 1906). However, the material is too meagre to enable me to refer the specimens to *Sag. zetesios* with certainty.

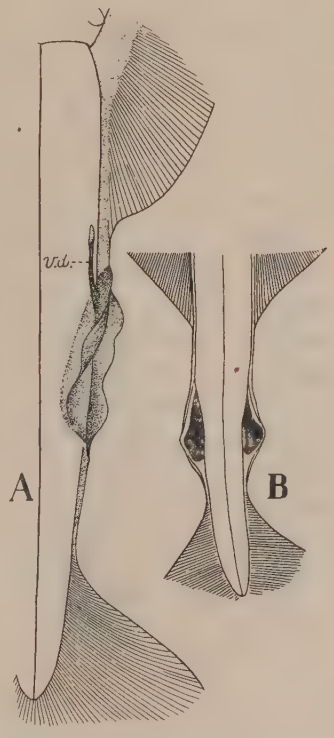

Fig. 2. *Sag. planctonis*; seminal vesicle. A—Dorsal side of Japanese specimen, B—From Ritter-Záhony (1911 a).

(17) *Pterosagitta draco* (Krohn), 1853 (Pl. III, fig. 9)

Sagitta draco, Krohn, 1853.
Spadella draco, Hertwig, 1880; Langerhans, 1880; Grassi, 1883; Strodtmann, 1892;

Conant, 1896; Aida, 1897; Doncaster, 1903; Krumbach, 1903; Fowler, 1906; Ritter-Záhony, 1910; Michael, 1911.

Spadella draco+*Spadella vougai*, Béraneck, 1895–6.

Pterosagitta draco, Ritter-Záhony, 1911 a, b, c; Germain & Joubin, 1916; Johnston & Taylor, 1919; Michael, 1919; Bollmann, 1934.

This species is common, but not very abundant.

(18) *Eukrohnia hamata* (Möbius), 1875

Krohnia hamata, Hertwig, 1880; Langerhans, 1880; Strodtmann, 1892, 1905; Conant, 1896; Krumbach, 1903; Fowler, 1905, 1906.

Spadella hamata, Grassi, 1883; Fowler, 1896.

Krohnia foliacea, Aida, 1897.

Krohnia hamata+*Krohnia hamata* var. *borealis*, Moltschanoff, 1907.

Eukrohnia hamata, Ritter-Záhony, 1910 a, 1911 a, b, c, 1914; Michael, 1911, 1919; Germain & Joubin, 1916; Bollmann, 1934; Fraser, 1937.

Eukrohnia richardi, Germain & Joubin, 1912.

Eukrohnia hamata+*Eukrohnia hamata* var. *antarctica*, Johnston & Taylor, 1921.

(? *Eukrohnia fowleri*).

Forty-four specimens, up to 14 mm in length and immature, were collected from the surface waters off Susaki. The eyes are pigmentless and the lateral fins are without rays. In these points, the present material differs from *Krohnia foliacea* which was found by Aida in Misaki Harbour.

This species is the commonest deep-water chaetognath. The intestine was frequently coloured red when fresh, which colouration is probably due to the food which consists chiefly of a species of deep-sea copepods, *Euchaeta sp.* The two specimens in the present collection have 12–13 hooks and very distinct papillae on their vestibular ridges as tabulated below. In this respect they show some resemblance with *Eukr. fowleri*, but they differ from the latter in having no pigment in their eye. They are according to be referred rather to *Eukr. hamata*.

Body length in mm	Tail segment in %	Hooks	Teeth
28	25	13–12	16
28.1	22.1	12–12	17

Eukr. hamata var. *antarctica* Johnston and Taylor is apparently synonymous with the type form, *Euk. hamata*.

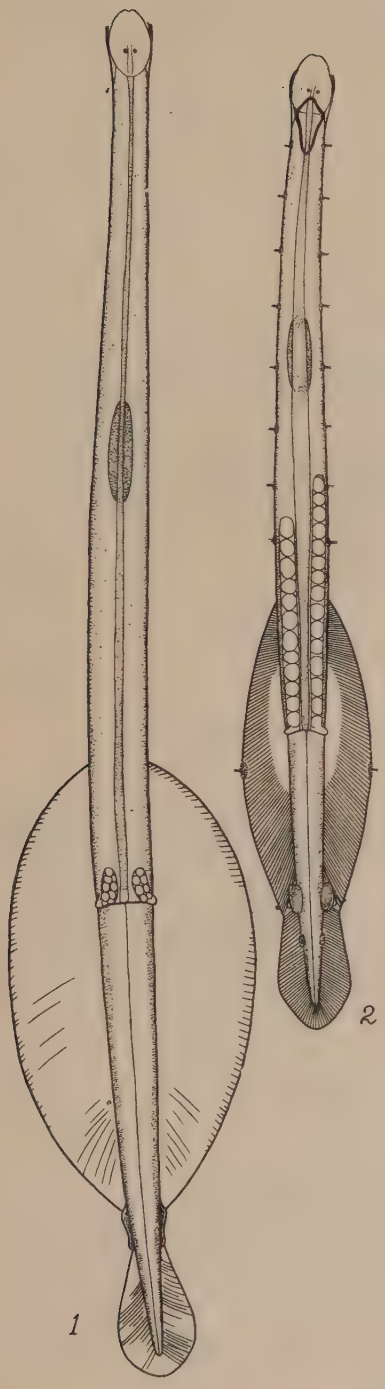

Fig. 3.
1—*Krohnitta subtilis*, dorsal, ×12.
2—*Krohnitta pacifica*, dorsal, ×12.

(19) *Krohnitta subtilis* (Grassi), 1881
(Figs. 3–*1*, 4–*2*)

Spadella subtilis, Grassi, 1883.
Krohnia subtilis, Strodtmann, 1892, 1905; Fowler, 1905, 1906.
Krohnitta subtilis, Ritter-Záhony, 1910 b, 1911 a, b, c; Germain & Joubin, 1916; Johnston & Taylor, 1919; Michael, 1919; Bollmann, 1934.
Eukrohnia subtilis, Michael, 1911.

(20) *Krohnitta pacifica* (Aida), 1897
(Figs. 3–*2*, 4–*1*)

Krohnia pacifica, Aida, 1897; Doncaster, 1903; Fowler, 1906.
Krohnitta kerberti, Oye, 1918.

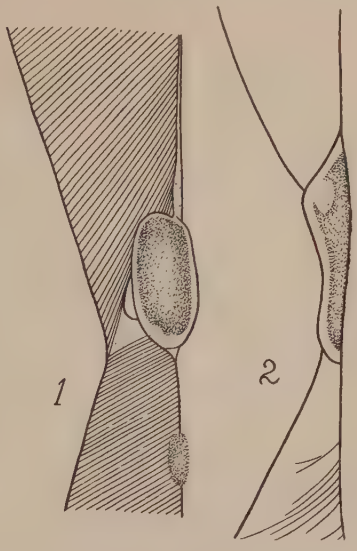

Fig. 4.
1—Seminal vesicle of *Krohnitta pacifica*, dorsal, ×70.
2—Seminal vesicle of *Krohnitta subtilis*, dorsal, ×70.

This species is related closely with *Krohnitta subtilis*, but it has several distinctive features as shown below:

	K. pacifica	*K. subtilis*
1) Length of mature individuals	8.6 mm	11 mm
2) Proportion of tail segment	28.4–35.4%	32.4–40.0%
3) Width of body	Somewhat broader than in *K. subtilis*.	Very slender.
4) Lateral fin	Rounded, posterior end frequently extends caudally beyond the seminal vesicle and fuses with tail fin, leaving a small space beside the vesicle. Usually fin rays are diminished in various grades; there is a distinct rayless inner zone beside the tail septum even when the rays are preserved completely.	Rounded, much wider than that of *K. pacifica*. Fin rays are usually seen merely along margin. Sometimes a few rays of posterior portion are preserved incompletely.
5) Tail fin	Somewhat angular spatuliform.	Spatuliform.
6) Armature Hooks	8–11	7–9
Teeth	11–15	10–11
7) Ovary	Reaches anteriorly beyond the anterior end of lateral fin. Ova large.	Very short in even fully mature individuals. A few ova are small in size.
8) Seminal vesicle	Comparatively large, oval in shape.	Comparatively small, elongated; its anterior portion is somewhat thickened.
9) Occurrence	Common, but not abundant.	Very rare.

(21) *Sagitta elegans* Verrill, 1873

Sagitta sp., Verrill, 1885.

Sagitta elegans + *Sagitta falcidens* + *Sagitta gracilis*, Strodtmann, 1892.

Sagitta elegans + ?*Sagitta flaccida*, Conant, 1896; Galzow, 1909.

Sagitta elegans, Michael, 1911; Ritter-Záhony, 1911 a, b, 1914; Germain & Joubin, 1916; Meek, 1928.

Sagitta elegans elegans, Ritter-Záhony, 1911 c; Fraser, 1937.

Three well preserved specimens (25.5–31 mm), collected from the

cold waters of North Tisima* (Torino-o-Misaki) in August 1936, were offered to me by Mr. S. Okuda.

(22) *Spadella cephaloptera* (Busch), 1851 (Pl. III, fig. 10)

Spadella cephaloptera, Hertwig, 1880; Langerhans, 1880; Strodtmann, 1892, 1905; Fowler, 1906; Ritter-Záhony, 1911 c; Germain & Joubin, 1916; John, 1932–3.

Sagitta cephaloptera+*Sagitta claparèdi*+*Spadella mariana*+*Spadella pontica*, Grassi, 1883.

Spadella musculosa, Lo Bianco, 1903.

Spadella moretonensis, Johnston & Taylor, 1919.

Eleven mature specimens, three large and eight small ones, were offered to me by the kindness of Mr. N. Yoshii of Misaki Marine Biological Station.

They were all collected near Misaki among the eel grass. The larger individuals are 4–4.2 mm in length and have the corona ciliata somewhat depressed posteriorly as in *Spadella cephaloptera*, while the smaller individuals are 2.1–3 mm and have regularly elliptical corona ciliata on the neck. There is no intermediate form among the present specimens, but more specimens are needed for making their identities clear.

II. Notes on the structure of the seminal vesicle.

It has been noted that the shape and situation of the seminal vesicle can be used for identification of the species of Chaetognaths, and many authors have made use of this characteristic for the classification of their materials.

There are, however, only a few incomplete descriptions of the structure of the seminal vesicle aside from the works of Hertwig (1880), Grassi (1883) and of Burfield (1927) on *Sag. bipunctata* and of John (1932–3) on *Spadella cephaloptera*. Besides these investigators, Ritter-Záhony has given precise descriptions of the shape and situation of the seminal vesicle of various species. However, none of the authors records the structure of this organ in various species fully.

I have had many chances, in these two years, to obtain plenty of fresh specimens, young and mature, of various Chaetognaths. On examing this material, I have been impressed by the difference in structure of this organ among different species, besides the differences according to the stage of development, as well as some individual

* Kurile Islands.

variations. The most voluminous size and shape which the seminal vesicle of each species can take on, differs from species to species.

In the following I propose to describe in some detail the shape and structure of the seminal vesicles and vasa deferentia of many of the species which I have dealt with above.

(a) General structure. (Pls. III, IV)

The seminal vesicle is a sac which serves for preserving the mature spermatozoa which develop in the tail segment and are sent into the vesicle through vas deferens.

Vas Deferens: This duct is usually shorter than the vesicle, except in *Sag. serratodentata* in which it is as long as the latter. A rounded or oval anterior (internal) opening is situated in the dorsal part of the lateral field in front of the seminal vesicle, while "the posterior opening is slightly more ventral in position than the anterior opening so that the tube slopes ventrally a little on its way back" as described precisely by BURFIELD (1927). The duct is walled throughout with a layer of cells, being in contact externally with the basal membrane of the stratified body epidermis and internally with the endothelial cells of the lateral area of the tail segment. The internal opening is thickened slightly into a sort of lip. In *Sag. enflata* and *Sag. hexaptera,* the anterior opening is considerably larger than in other species. BURFIELD says "the duct is lined throughout with a simple epithelium, which is in two layers at the thickened lips of the internal opening." In all of my preparations, however, the outer layer is not confined to the thickened lip, but con-

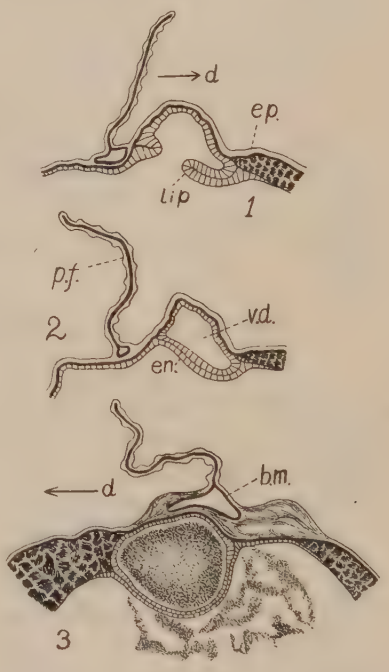

Fig. 5.
Transverse sections of vas deferens, ×130.
1—*Sagitta bedoti*, through the internal opening, 1 in Fig. 7–*3*.
2—*Sagitta bedoti*, through 2 in Fig. 7–*3*.
3—*Sagitta serratodentata*, through the swelled portion, 1 in Fig. 10–*1*.

tinues posteriorly along the whole course of vas deferens in close contact wtih the wall of the duct, in other words, this outer layer in the thickened lip is merely a small part of the endothelium of the tail segment. Burfield (1927) and John (1932–3) state that the endothelium of the duct is ciliated at least in two terminal portions, although they could not discover any cilia there. In the many specimens in my hand the cells near the anterior and posterior openings are stained by Haematoxylin more deeply than in other portions, though I also could not verify the existence of any cilia on the wall cells. The duct is almost of uniform width throughout the whole course, except the anterior portion near the internal opening and posterior portion near the vesicle, where it is often so narrow that the lumen of the duct is hardly distinguished. In *Sag. serratodentata,* the duct is swollen in a peculiar manner as shown in figs. 5, 10, and contains a compact mass of sperms. Usually the duct opens posteriorly into the seminal vesicle at the anterior end of the latter (as in *Sag. bedoti, Sag. enflata* and many other species), but in *Sag. serratodentata* and *Sag. robusta* the opening is found at some more posterior region. As to the mechanism of sending the sperms into the duct, I agree with John (1932–3) in the assumption that the current in the tail segment will be the chief agency of this process. This current is observed almost in all the species described, even in *Sag. enflata* in which the sperms are found only in the posterior portion of the tail segment, forming a compact mass. The direction of the current is such that only mature sperms can go into the duct. Neither cilia nor muscle fibres exist in the duct, although it is possible that the contraction of the body muscles will bring the sperms into the duct.

Seminal Vesicle: The vesicle may be spherical (*Sag. enflata*), ovoid to ellipsoidal (*Sag. neglecta, Sag. bedoti*), or somewhat elongated (*Sag. regularis, Sag. minima*), or it may consist of two portions, an elongated posterior (trunk) and a rounded anterior (head) portion, as in *Sag. robusta.* The most complex vesicle is found in *Sag. serratodentata,* where it is provided with several chitinous teeth and a frothy collarette-like tissue which is disproportionately voluminous for the vesicule proper. The vesicle is covered on its surface with the stratified epidermis which is thickened along the dorsal and ventral bases of the vesicle into a sort of collarette. The wall of the vesicle consists of a layer of columnar cells, the height of which varies according to species or in different positions in one individual. In *Sag. bedoti, Sag. serrato-*

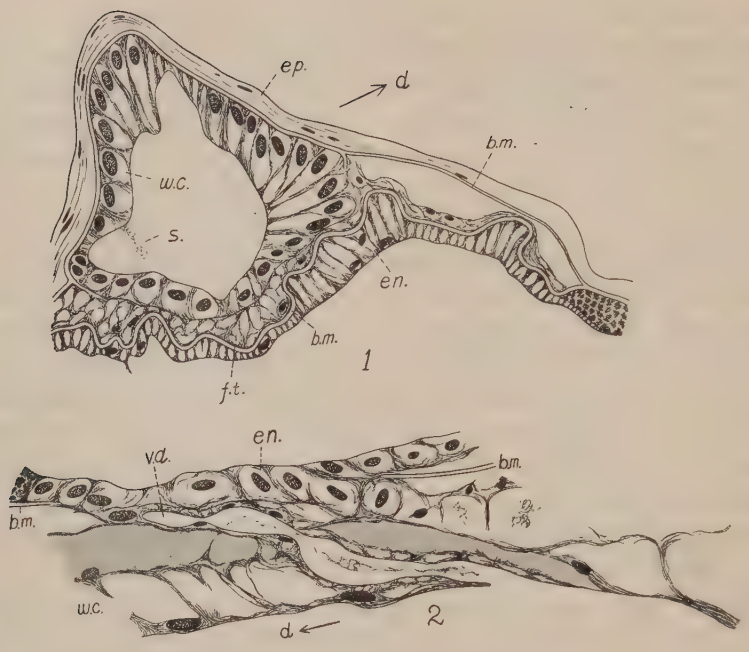

Fig. 6.

1—*Sagitta bedoti,* transverse section through the anterior end of the seminal vesicle, 3 in Fig. 7–*3*, ×750.

2—*Sagitta serratodentata,* transverse section through the posterior opening of the vas deferens, ×1100.

dentata and *Sag. enflata,* the cells are rather low, while in *Sag. robusta, Sag. neglecta* and *Sag. minima,* they are somewhat taller than in the former.* Usually, the wall of the anterior portion of the vesicle is thicker than that of the posterior portion. *Sag. bedoti, Sag. neglecta* and *Sag. minima* have the wall nearly of uniform height, though in the anterior portion it is slightly thickened. In *Sag enflata,* the ventro-lateral portion of the vesicle is thickened conspicuously. In the species like *Sag. robusta* in which the distinction of the head and the trunk occurs, the wall cells of the head are much higher than those of the trunk.

This thickened portion may be called the glandular area, as it secretes a substance which shows strong affinity with eosin. I found

* All the observations are based on fully mature individuals showing the maximum size of the seminal vesicle.

this secretion in the thickened glandular areas of the vesicles of *Sag. enflata, Sag. serratodentata,* and in the head of *Sag. robusta.* The distal portion of the cells forming this glandular area is swollen and stained deeply by eosin in the first stage, then it becomes frothy and finally collapses. The secretion thus formed fills up the lumen of the vesicle mingled with sperms, and is ejected through the opening, or by burst of the vesicle. The nuclei of the wall cells are usually basal in position, although sometimes they are situated more distally as found in the head of the vesicle in *Sag. robusta* and in the anterior portion of the vesicle of *Sag. neglecta.*

The internal portion of the vesicle along the lateral side of the tail segment consists of three layers, the wall layer of the vesicle, the extension of the body epidermis, and the endothelium of the lateral area of the tail segment. The extension of the body epidermis is somewhat frothy, with a ditsinct basal membrane showing a compact appearance. In the small vesicle as found in *Sag. enflata, Sag. neglecta,* or in the posterior-most portion of the vesicle of *Sag. robusta* and *Sag. bedoti,* the middle layer is distinguished merely by the existence of this basal membrane.

Previous authors consider that the sperms go out through the external opening which is usually small and situated at the anterior portion of the vesicle. But in my opinion the sperms are ejected in most cases through a slit made by burst of the vesicle, consequently the so-called external opening marks merely the point of initial burst. The place where the burst occurs is characteristic in each species. For instance, in *Sag. bedoti* the vesicle ruptures along the whole lateral margin, while in *Sag. robusta* and *Sag. ai,* only the lateral or ventro-lateral side of the head ruptures. These places show a somewhat different structure from elsewhere. In *Sag. robusta,* the wall on the ventro-lateral side of the head is extremely thin; in *Sag. bedoti,* there is a sort of ridge along the line of burst (Pl. IV, figs. 4, 12). In the species having the vesicle of the primitive style like *Sag. enflata* and *Sag. hexaptera,* a rather irregular burst occurs around the external opening. Only in *Spadella cephaloptera* no trace of rupture has ever been observed.

Colouration of the Vesicle: In the living specimens of *Sag. bedoti, Sag. enflata,* and *Pterosagitta draco,* reddish-brown pigment spots are occasionally found in the posterior portion of the vesicle.

(b) Descriptions of seminal vesicle of each species.

The seminal vesicles of *Sagittae* may be classified into four types according to the shape in the matured state.

1) *enflata*-type. The most primitive type comprising the vesicle occurrs in *Sag. enflata, Sag. lyra* and *Sag. hexaptera.* The vesicle is comparatively small, spherical or ellipsoidal, being never divided into the head and the trunk. The anterior opening of the vas deferens is rather large, oval; the posterior opening is situated at the frontal end of the vesicle. The glandular area is located in the middle portion of the vesicle, not in the anterior portion. The external opening is situated near the glandular area. The vesicle bursts in its posterior

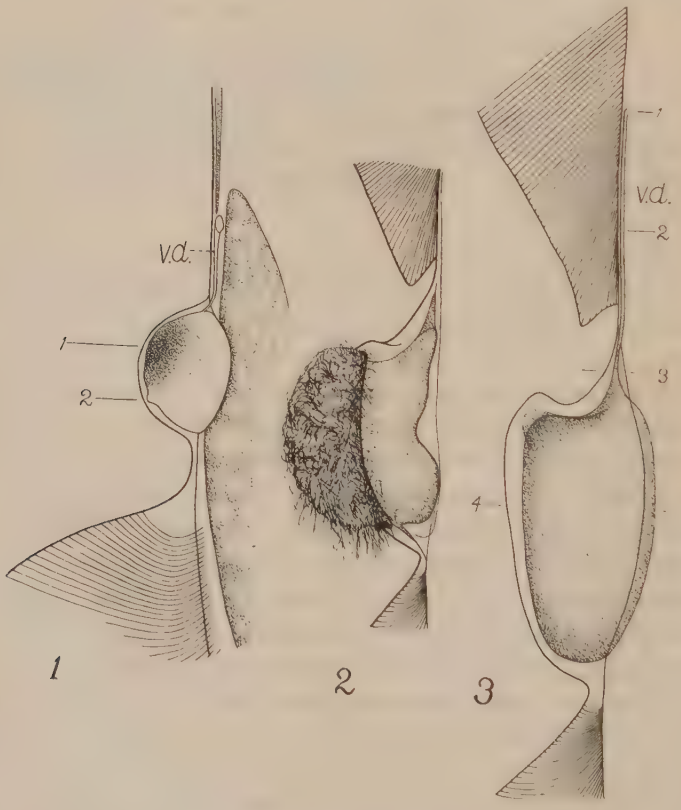

Fig. 7. Seminal vesicles of *enflata* & *bedoti*-type.
1—*Sagitta enflata,* ventral, ×50.
2—*Sagitta bedoti,* bursting moment, ventral, ×45.
3— „ „ , ventral, ×50.

half to eject the sperms. In *Sag. enflata* the vesicle is spherical, and situated at the front base of the tail fin apart widely from the posterior fin. The round glandular area lies in the ventro-lateral part, slightly in front of the middle of the vesicle, being depressed slightly around its centre. The external opening lies near the posterior margin of this area. Only the small portion surrounding the external opening bursts. *Sag. lyra* and *Sag. hexaptera* have both comparatively small vesicles which are somewhat elongated and rupture in the posterior half when mature. In the former species, the vesicle is situated nearer the posterior fin than the tail fin; while in the latter the vesicle is situated nearer the tail fin. In a fully mature *Sag. hexaptera*, an oval anterior opening of vas deferens is visible in front of the vesicle.

2) *bedoti-type*. This group comprises *Sag. minima, Sag. neglecta, Sag. regularis* and *Sag. bedoti*. The vesicle is ovoid or elongate-ellipsoidal, showing a somewhat smooth appearance. The head and trunk are not yet differentiated. The wall of the vesicle is usually of a uniform height, though it is slightly taller in the anterior portion. The vas deferens opens into the vesicle at the anterior end of the latter. The external opening is situated at the antero-lateral corner, though the ejection of sperms is performed mainly through a slit made by rupture.

Sag. bedoti: The vesicle is elongate-oval, having a slight prominence at the antero-lateral corner. It is situated in contact with both the posterior and tail fins. The wall cells are low. There is a longitudinal ridge along the ventro-lateral side of the vesicle; and the burst occurs along this line; the fissure extends from the antero-lateral corner to the posterior end of the vesicle.

In *Sagitta regularis* and *Sag. neglecta* the vesicle is situated just behind the caudal end of the posterior fin

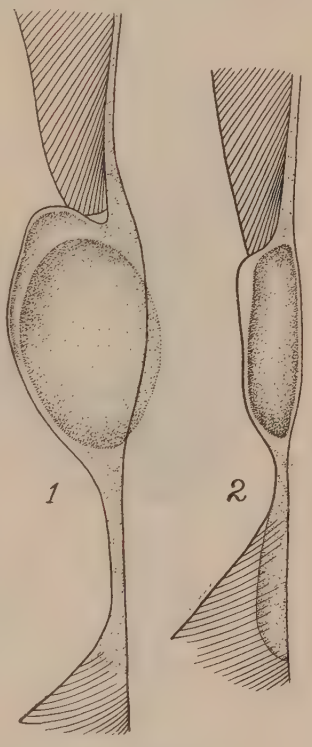

Fig. 8.
1—Seminal vesicle of *Sagitta neglecta*, dorsal, ×90.
2—Seminal vesicle of *Sagitta regularis*, dorsal, ×90.

fairly apart from the tail fin, and the wall cells are rather tall. In the former species, the vesicle is cocoon-shaped, with the anterior half somewhat larger than the posterior half. In the latter species, the vesicle is oval, with a round projection at the antero-lateral corner. The wall cells are somewhat taller in the antrior portion than in the posterior portion. The burst occurs usually along the lateral margin of the anterior half in both species, though the fissure reaches sometimes more posteriorly near the caudal end of the vesicle. *Sag. minima* has the vesicle much like that of *Sag. regularis*; the wall cells are somewhat taller than those of *Sag. bedoti*. The vesicle is situated at the front base of the tail fin widely apart from the posterior fin. The antero-lateral corner is slightly projected; the burst occurs along the lateral margin of the anterior half.

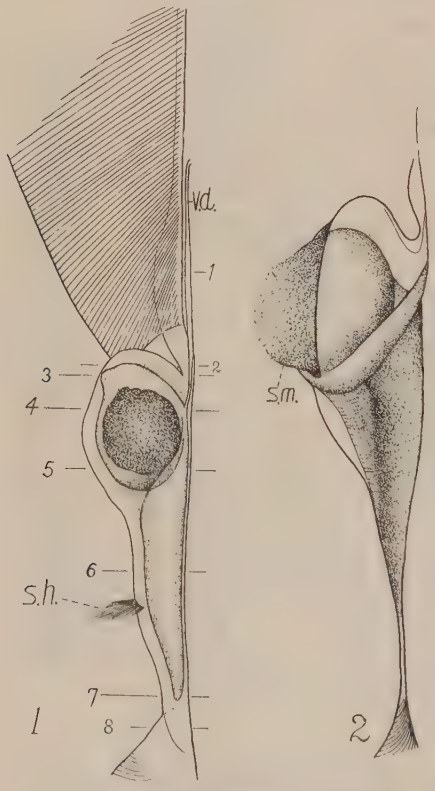

Fig. 9. Seminal vesicles of *robusta*-type.
1—*Sagitta robusta*, dorsal, ×50.
2—*Sagitta decipiens*, ventral, ×60.

3) *robusta*-type. *Sag. pulchra, Sag. decipiens, Sag. bipunctata, Sag. ai* and *Sag. robusta* belong to this group. In the vesicles of these species, the head and trunk are differentiated, though in some species the distinction is not very clear. The glandular area forms the head. The vas deferens opens into the vesicle slightly behind the front end of the latter. The external opening is situated at the antero-lateral corner of the head; the rupture occurs usually on the lateral side of the head. In *Sag. robusta* the vesicle is in contact with both the posterior and tail fins. There is a thickening of the collarette in front of the vesicle; also the basal portion of the tail fin is thickened considerably. The head is very large, much broader than the trunk. The wall of the ventro-lateral side of the head is very

thin; and burst occurs along this position. In *Sag. ai* the situation of the vesicle is the same as in *Sag. robusta,* but there is no thickening of the collarette in front of the vesicle. The head is rather indistinct; the burst occurs usually along the lateral side of the head, though the fissure frequently reaches more posteriorly. In *Sagitta pulchra,* the posterior fin ends at a short distance in front of the vesicle which is a low projection, with a somewhat thickened anterior portion foreshadowing the head of other species of this group. The vesicle of *Sag. decipiens* is situated at the base of the tail fin apart widely from the posterior fin; its head has a small knob at the anterior margin. The rupture occurs on the ventro-lateral side of the head. In *Sag. bipunctata,* the vesicle is located at the base of the tail fin fairly apart from the posterior fin. The burst occurs along the ventro-lateral side of the head. In no Japanese specimens could I observe the cuticular

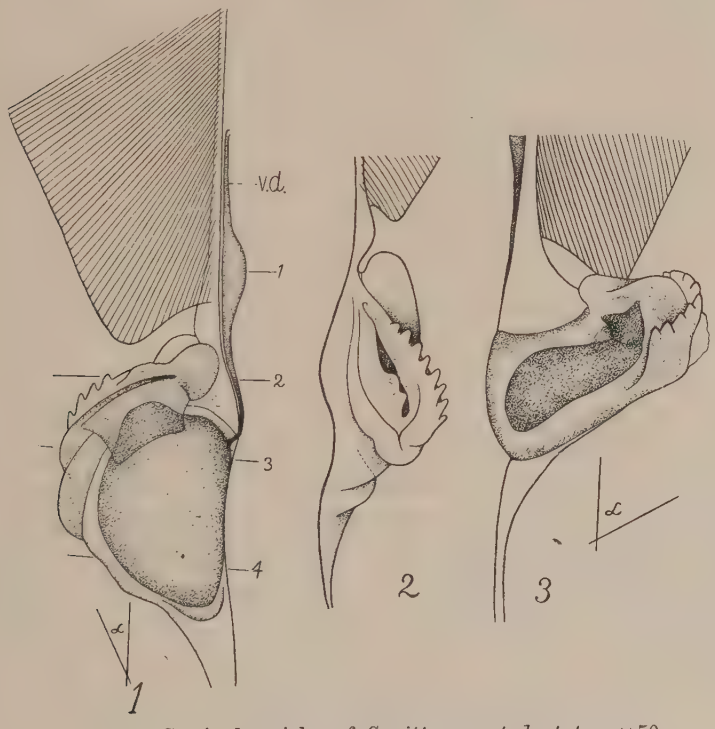

Fig. 10. Seminal vesicles of *Sagitta serratodentata,* ×50.

1—usual form, dorsal.
2—usual form, ruptured, dorsal.
3—rare form, ventral.

structure described by RITTER-ZÁUONY (1910) in the West-Indian specimens. In well preserved specimens, a conspicuous thickening of the collarette is seen in front of the vesicle.

4) *serratodentata*-type. The vesicule proper is much deformed by the voluminous collarette. The vas deferens is as long as the vesicle, and enters the latter much behind the frontal end of the vesicle. In *Sag. serratodentata* the angle between the axes of the tail segment and the vesicule proper is much smaller in the Japanese specimens than in the European specimens, though there are some exceptional individuals showing a large angle as in the latter and also intermediate forms uniting the Japanese and European forms. The collarette is very voluminous in the anterior half filling up the space between the vesicule proper and the tail segment completely. In all the Japanese specimens 5–10 chitinous teeth (RITTER-ZÁHONY describes 2 pointed papillae in Antarctic specimens, 1911 a), pointed towards the ventral side, are present along the lateral margin in the anterior half. There is a thickening of collarette just at the front base of the vesicle. The wall cells are rather thin, except in the anterior portion where they are thickened very much and form a glandular area. The external opening is situated at the antero-lateral part on the dorsal side. The burst occurs usually on the dorsal side as shown in Fig. 10, but the vesicle may be broken in the postero-ventral portion free from the collarette—the latter seems to belong to abnormal cases. The vas deferens has a conspicuous swelling in its course. In *Sag. pseudoserratodentata*, the antero-lateral corner has a finger-shaped protuberance. There is a thickening of the collarette in front of the vesicle. The external opening is situated at the antero-lateral portion on the ventral side.

Pterosagitta draco has a vesicle of the simple *robusta*-type which is situated just behind the posterior fin and continued to the tail fin by means of the collarette. The vesicle of *Spadella cephaloptera* is reniform as shown in Pl. III, fig. 10, with the external opening situated near the middle of its lateral side. The vesicle of *Krohnitta pacifica* is oval like that of *Sag. neglecta*, while that of *Krohnitta subtilis* is enlarged in its anterior portion as in *Sag. robusta*.

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Explanation of Plate.

Pl. I. *Sagitta ai*, n. sp.

1. Entire animal, dorsal, ×7.
2. Anterior portion of body, dorsal, ×22.
3. Irregular corona ciliata, ×22.
4. Seminal vesicle, ventral, ×20.
5. Head of the ruptured vesicle, ventral, ×50.
6. Hook, ×20.
7. Point of the hook, ×1470.
8. Anterior and posterior teeth, ×130.
9. Point of the posterior tooth, ×1470.

Pl. II. *Sagitta pseudoserratodentata*, n. sp.

1. Entire animal, dorsal, ×16.
2. Anterior portion of body, dorsal, ×80.
3. Seminal vesicle, ventral, ×80.
4. Hook, ×80.
5. Point of the hook, ×1770.
6. Anterior and posterior teeth, ×440.
7. Point of the posterior tooth, ×1770.

Pl. III. Shape and situation of the seminal vesicle.

1. *Sag. hexaptera*, dorsal, ×13.
2. *Sag. lyra*, dorsal, ×20.
3. *Sag. enflata*, ventral, ×35.
4. *Sag. pulchra, dorsal*, ×35.
5. *Sag. minima*, ventral, ×60.

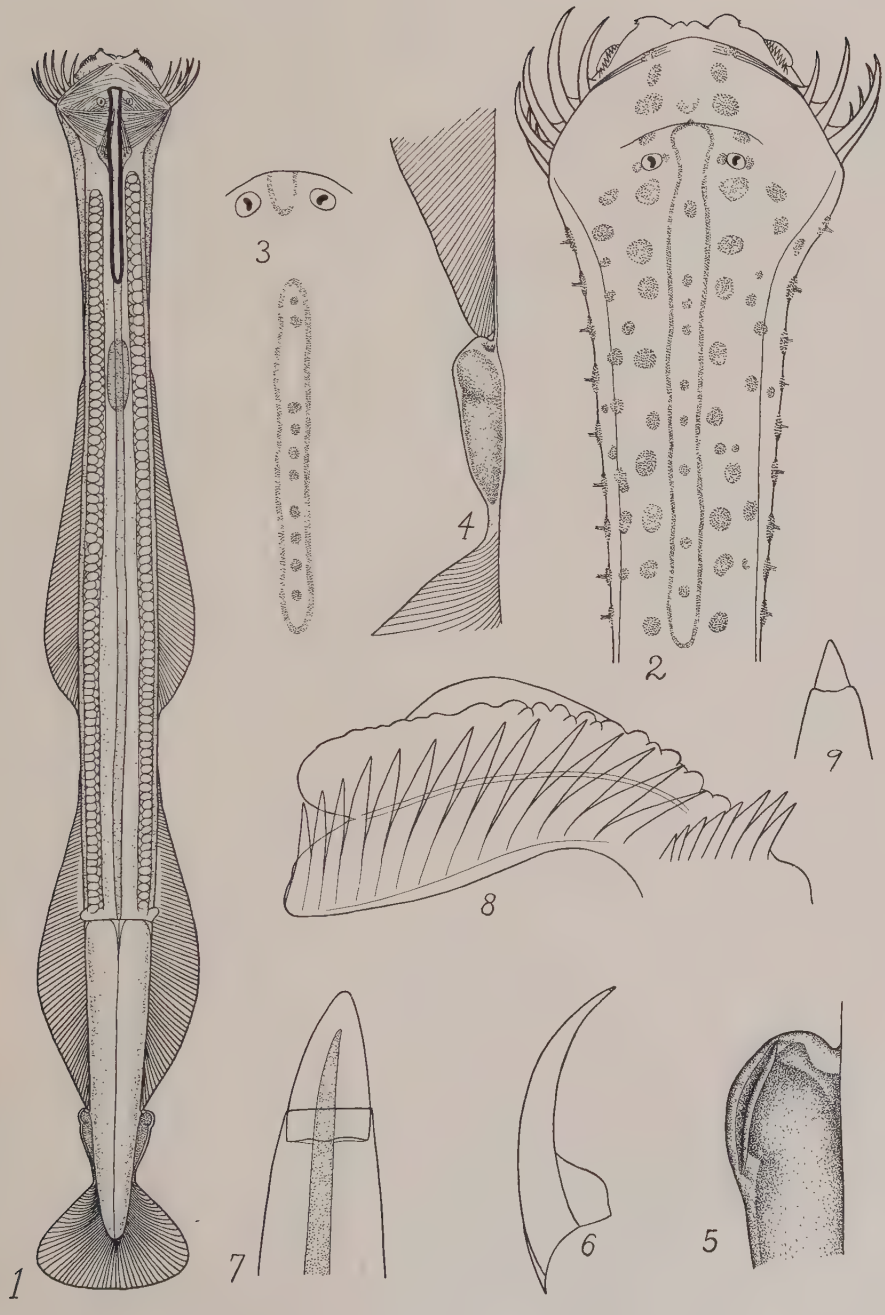
6. *Sag. decipiens*, dorsal, ×25.
7. *Sag. robusta*, ventral, ×45.
8. *Sag. bipunctata*, dorsal, ×45.
9. *Pterosag. draco*, dorsal, ×35.
10. *Sp. cephaloptera*, dorsal, ×70.

Pl. IV. Transverse sections of the seminal vesible, ×230.

1. *Sag. robusta*, through the vas deferens, 1 in Fig. 9–*1*.
2. „ „ , through 2 in Fig. 9–*1*.
3. „ „ , „ 3 „ .
4. „ „ , „ 4 „ .
5. „ „ , „ 5 „ .
6. „ „ , „ 6 „ .
7. „ „ , „ 7 „ .
8. „ „ , „ 8 „ .
9. *Sag. enflata*, through the glandular area, 1 in Fig. 7–*1*.
10. „ „ , through the external opening, 2 in Fig. 7–*1*.
11. *Sag. bedoti*, through 3 in Fig. 7–*3*.
12. „ „ , „ 4 „ .
13. *Sag. neglecta*, through the external opening.
14. *Sag. serratodentata*, through the external opening, 2 in Fig. 10–*1*.
15. „ „ , through 3 in Fig. 10–*1*.
16. „ „ , „ 4 „ .

ABBREVIATIONS.

b.m. ..... basal membrane.
b.p. ..... bursting position.
col. ..... collarette.
d ..... dorsal side.
en. ..... endothelium of the tail segment.
ep. ..... stratified epithelium.
ex.o. ..... external opening.
f.t. ..... frothy tissue.
i.o. ..... internal opening.
p.f. ..... posterior fin.
s. ..... secretion.
s.h. ..... sensory hair.
s.m. ..... sperm mass.
s.t. ..... sensory prominence.
t. ..... chitinous tooth.
t.f. ..... tail fin.
v.d. ..... vas deferens.
w.c. ..... wall cell.
← arrow points dorsally.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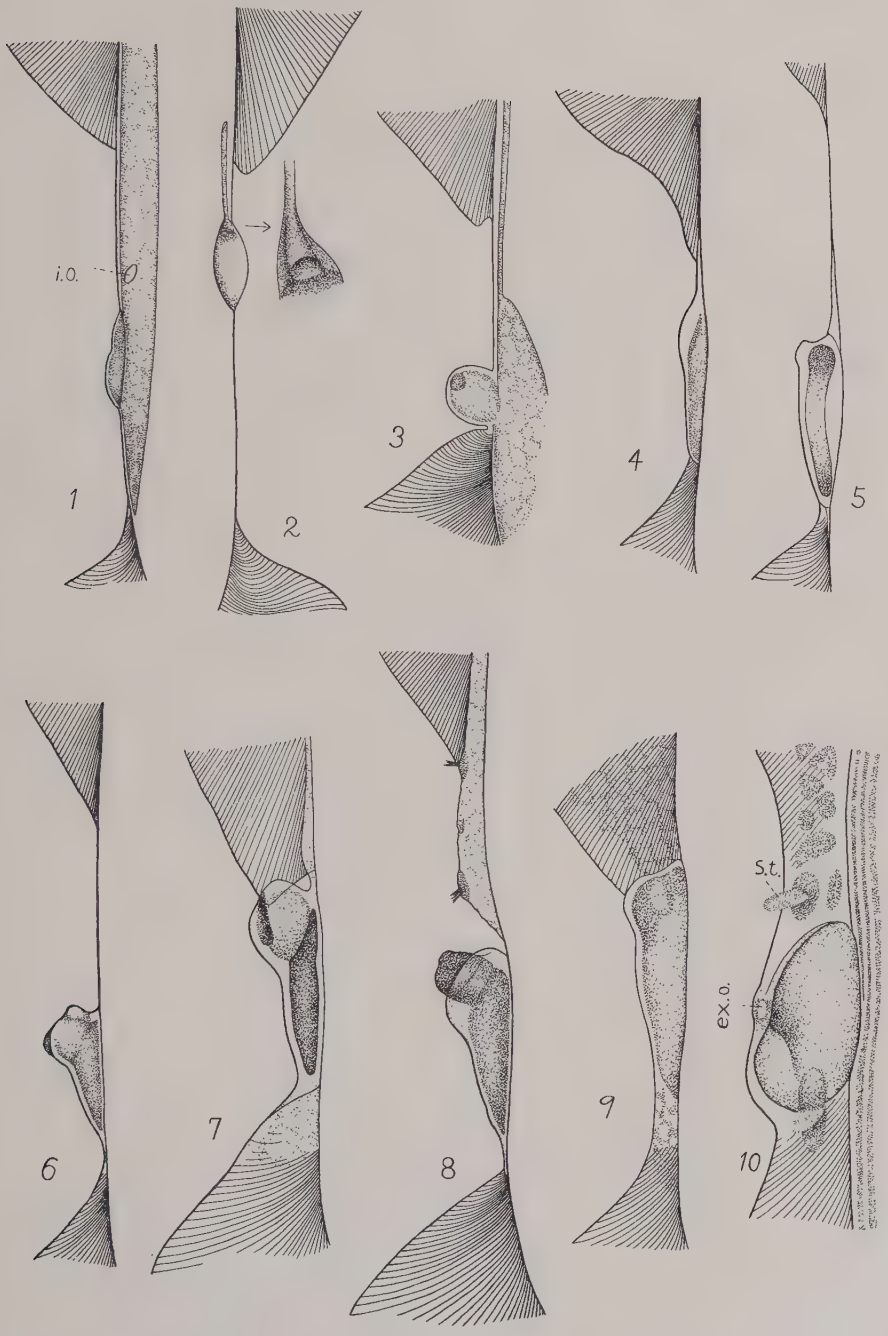
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Plate IV.

Peculiarities of the Pedicellariae in *Psychocidaris* (Cidaroida, Psychocidaridae)[1]

By

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(With 2 Plates)

Psychocidaris ohshimai Ikeda from Ogasawara-zima (Bonin Islands) in the western Pacific, having imperforate primary tubercles and lacking peristomial interambulacral plates, was described as a most specialized form of the recent cidarids (Ikeda, 1935) ; and subsequently, further examination of its characters led me to create a family (Psychocidaridae) for it, as distinct from the Cidaridae (Ikeda, 1936).

The peculiarities of pedicellariae are systematically of great importance not only in the cidarids but also in the other echinoids, as ascertained by Koehler (1883), Mortensen (1903, 1928), Döderlein (1906) and others. Accordingly the pedicellariae of *Psychocidaris,* which have not been reported in detail hitherto, will be closely examined in the present paper. There seem to occur three kinds of pedicellariae in this species, as will be shown below. One of them, the globiferous form, seems to be a new type in the Echinoidea, having peculiar cells inside the valves and no poison gland either inside or outside the valve. The importance of these points as distinctive characteristics will also be discussed hereunder. Here I should like to acknowledge my indebtedness to Professor Hiroshi Ohshima for his kind advice and guidance.

General observations of pedicellariae

Globiferous pedicellaria Pl. V (I), Figs. 1–7

The globiferous pedicellaria is of a yellowish tint and very coarse

1) Contributions from the Zoological Laboratory, Kyûsyû Imperial University, No. 111: A part of the expense for this work was provided from the research fund of the Imperial Academy.

in structure, being fairly common on all parts of the test. The pedicellaria appears to be of one type only, though slightly variable in size.

The head of the globiferous pedicellaria, composed of three valves, is attached immediately on the stalk. The valves are 1.2 mm in length on an average, being about as long as the stalk; the stalk is the same as that of the cidarids, with its upper end abruptly diminished like the wick of a candle. The blade of the valve[2] is sharply divided from the base by a wall on the inside. Some peculiar thorns occur along a line on the outside of the valve that corresponds to the extension of the partition-wall inside. The blade is much less developed than the base which is long and much swollen out and increases in size towards the articular surface; the lateral teeth of the blade are not conspicuous, being in an irregular double series, and the end teeth are quite indistinct.

Neither the poison gland nor the special cavity of the gland is found in any region of the blade and the base.

As will be shown later, the globiferous pedicellaria is provided with three kinds of muscles (cf. microscopical observations of the globiferous pedicellaria).

Tridentate pedicellaria Pl. V (I), Figs. 8–14

Two kinds of tridentate pedicellariae, the large and the small, occur usually in the present species. Both of them have three valves on a long stalk. The large form is found on every part of the body and especially abundantly among the scrobicular spines; the small form is usually found among the scrobicular spines.

In the present species the difference between the large and the small tridentate pedicellariae lies simply in the features of both the valves and the stalk; in the large pedicellaria the valves are much larger than in the small one, and the stalk is just the same as that of the typical cidarid form; on the other hand, in the small pedicellaria the valves are shorter, and, so far as I know, the stalk resembles most closely that of *Rhopalocidaris hirsutispina* (DE MEIJERE) figured by MORTENSEN (1928, Pl. LXXIX, Fig. 9), though it also appears to be somewhat similar to the form of the echinid in that it does not seem to be markedly diminished at its upper end.

2) This valve looks very much like that of *Psammechinus miliaris* (MÜLLER) figured by MORTENSEN (1903, Fig. 1).

Large tridentate pedicellaria: The valves are 1.6 mm in length on an average and much shorter than the stalk. Both sides of the blade are rolled-in slightly at the upper end, and towards the lower part the turning increases gradually, as, at the same time, the breadth of the blade diminishes after it has attained to the maximum at about one third of the length below the rounded tip, till in the lowest one third, where it is the narrowest, the blade assumes a sheath-like form. Moreover, the three blades are curved in such a way that the adjoining ones come in contact with each other along the edge between the tip and the broadest part. The base is fairly conspicuous and resembles that of the cidarids.

Small tridentate pedicellaria: Both the valve and the stalk of the small tridentate pedicellaria are shorter and slenderer than those of the large pedicellaria. The valves are 0.6 mm in length on an average, being much shorter than the stalk and almost similar to the large form in shape.

Microscopical observations of the globiferous pedicellaria

Pl. VI (II), Figs. 1–11

The globiferous pedicellariae from dry specimens and from specimens preserved in 80 per cent alcohol were picked up for observation, and then they were fixed and at the same time decalcified with Bouin's fluid. The material was cut into sections 10–18 microns thick in paraffin, and the sections were stained with DELAFIELD's hematoxylin and eosin or with HEIDENHAIN's iron-hematoxylin and orange G.

On examining, under the microscope, series of both the longitudinal and transverse sections of the head and the stalk, the structure is easily recognizable as described below:

1. The common investing membrane is composed of nucleated epithelial cells, and much developed at the lower region of the base of the valve and also on the stalk.

2. The nucleated connective tissues, which, from their reticulation, are regarded to have been filled up with an enormous mass of calcareous matter, lie inside the epithelium.

3. The epithelium-like nucleated fusiform cells[3] are also seen just inside those connective tissues of the blade alone, and do not appear to be surrounded by nervous fibers.

3) Such cells as these are not found in any form of the tridentate pedicellariae.

4. The strong bands of adductor muscles,[4] by which the three valves are closely bound together, are each attached at either end to the apophysis and its adjacent region.

5. In the lower region of the base and the uppermost region of the stalk the connective tissues have flexor muscles.

6. In the stalk well-developed nucleated cells form a connective substance between the flexor muscles and the epithelia.

7. The flexor muscles of the base are surrounded by extensor muscles.

8. The reticulation of connective tissues in the valve is not altogether uniform, especially in the lower region of the base where it is obliquely elongated.

9. The peculiar epithelium-like cells on the inside of the blade do not fill up the whole cavity surrounded by the blades, but form some layers directly on the inner side of the connective tissues. The cells do not seem to be ciliated.

Remarks

It has been mentioned that three kinds of pedicellariae, viz., the globiferous, the large tridentate and the small tridentate, occur usually in the present species. Of these, the globiferous pedicellaria is very peculiar, for its valves have neither the poison gland nor the special cavity for the gland, but contain characteristic layers formed by the cells within them. Moreover, in the interior of the valve, the boundary between the blade and the base is defined by a wall. A globiferous form with such peculiarities has never been known in the cidarids, whether living or fossil (cf. Geis, 1936).

Brünnich-Nielsen (1925, Tab. I, Fig. 21)[5] and Mortensen (1932, Fig. 15) observed the globiferous pedicellariae of the fossil species *Tylocidaris valtica* (?). These pedicellariae appear to be quite different from those of *Psychocidaris ohshimai*. The two types differ not only in their general appearance (Ikeda, 1935), but also in the fact that the latter possesses no gland whatever, whereas the former is said to possess the opening of a gland. Attention may, however, be called to the fact that both of them agree in the shape of the base which is charac-

4) The question whether the muscles of both the valve and the stalk are striated or unstriated will be left for future researches.

5) Brünnich-Nielsen (1925) described the globiferous pedicellaria as a tridentate pedicellaria.

teristically well-developed. MORTENSEN (1932) refers especially to this feature which he noticed in the valve of the fossil form offered to him by BRÜNNICH-NIELSEN, when he admits that "a type of pedicellariae like this form is unknown in the recent cidarids" (p. 178). This acknowledgement, so long as it is valid, seems to encourage me to refer the form before me to no group among the living cidarids ever known, not to speak of fossil forms.

The fact that the blade in the present species is very small in comparison with the base may be assigned chiefly to the absence of a special chamber for gland cells, while the fact that the base is markedly swollen out must naturally be correlative with a strong development of the adductor muscles. Accordingly it may be assumed that these features make the function of the pedicellaria more effective (cf. UEXKÜLL, 1899).

The question whether both kinds of globiferous pedicellariae, the large and the small, may be expected in *Psychocidaris*, as in the cidarids, cannot be positively answered at present. But so far as the material available is concerned, it appears that either of the two types occurs, and referring for its identification to the pedicellaria in the cidarids figured by MORTENSEN (1928), I should like to call it the small form rather than the large one, especially in consideration of its simpler structure. MORTENSEN (1928, Pl. LXXX, Figs. 20, 21) gives the figures of the elongate tridentate-like form of the small globiferous pedicellaria in *Stereocidaris stylifera* MORTENSEN, which the present form seems to resemble. Besides, he says: "In species where the large globiferous form is only very rare the small form apparently plays its part, being correspondingly richly developed" (p. 32). These words may be applied to the present species which has only one kind of globiferous pedicellariae.

PROUHO (1888) pointed out the difference of the globiferous form of *Cidaris cidaris* (LINNÉ) (=*Dorocidaris papillata*) from that of *Sphaerechinus granularis* (LAMARCK) as consisting in the fact that in the former the poison gland has no muscle, while in the latter the wall of the gland sack is provided with muscles.[6] MORTENSEN (1903) investigated the difference of the globiferous form between the cidarids and other echinoids, and stated subsequently (1928) that in the

6) It was already stated by PERRIER (1869) that pedicellariae of the cidarids are clearly distinguishable from those of the other echinoids in shape.

cidarids "the poison gland lies inside the valves, enclosed in a special chamber of the calcareous skeleton (Fig. 18), while in the globiferous pedicellaria of other Echinoids the poison gland lies free, generally on the outside of the valve, hanging as a sack on its back" (p. 30). He then concluded by saying: "It may well be doubted, whether the globiferous pedicellariae of Cidarids are really homologous with those of other Echinoids" (p. 30), the same opinion as Döderlein (1906) had given before him.

The cells, at least, of the above-mentioned layer on the inside of the valve of *Psychocidaris* are not, as a matter of fact, homologous with the cells of the poison gland of the cidarids. They must be essentially different in origin, judging both from the examination of the gland cells of *Plococidaris verticillata* (Lamarck) and *Eucidaris metularia* (Lamarck)[7] and from the description of those of *Cidaris cidaris* (Linné) by Prouho (1888). The absence from those cidarids of the cells which in *Psychocidaris* are found composing the layer suggests the prevalence of the same feature in the whole Cidaridae.

Under the microscope, the layer looks something like the sensory organ of the pedicellaria found only in certain members[8] of the Echinidae and the Strongylocentrotidae. This organ, which seems to be more highly developed in the valve of the globiferous pedicellaria than in that of the tridentate form[9] (cf. Hamann, 1887), was already described by Sladen (1880), under the name of "tactile cushion," as performing a sensory function; by Hamann (1887) as "Sinnesorgan," by Kiernik (1906) as "Neurodermalorgan," and by Fujiwara (1935) as "neurodermal organ." Between the two, however, there is a great difference in that the tactile cushion of this organ is directly connected with the nerve, while the cells of the layer are not. This structure

7) These specimens of *P. verticillata* and *E. metularia* are from Yaéyama Islands in the Okinawa group.

8) The forms in which the organ was investigated and the respective investigators are as follows:

Sladen (1880), *Sphaerechinus granularis* (Lamarck).

Hamann (1887), *Echinus acutus* Lamarck, *Paracentrotus lividus* (Lamarck), *S. granularis* (Lamarck).

Kiernik (1906), *Psammechinus microtuberculatus* (de Blanville), *P. lividus* (Lamarck).

Fujiwara (1935), *Toxopneustes pileolus* (Lamarck).

9) The cells of the layer are not found in both the large and the small tridentate pedicellariae of *Psychocidaris*.

makes me hesitate to decide whether the layer in question is of any sensory function like the sense organ of the regular echinoids, even though it is homologous with the latter.

The above-named cidarids have gland cells in the valve instead of a sensory organ, while with *P. ohshimai* the reverse is rather the case. Why is the gland wanting in this species? No satisfactory answer can be given to this at present, but the globiferous pedicellaria of this species is apparently a variety of the globiferous form of the aforesaid regular echinoids, as it only lacks the gland sack. It may therefore be assumed, from the comparison of the valves of those three groups, that the presence of the layer in *Psychocidaris,* together with the absence of gland cells on both the exterior and interior sides of the valve, makes the globiferous pedicellaria of this species a type intermediate between those of the cidarids and the other regular echinoids. I should think, moreover, that this view, founded as it is merely on structural features of the valve of the globiferous pedicellaria, might lead to the conclusion that, in phylogenetic relationship, *Psychocidaris* comes between the cidarids and the other echinoids.

Indeed, the present species, which is clearly distinguishable from the Cidaridae by the remarkable characters of the globiferous pedicellaria, and has been made to represent a family, the Psychocidaridae, may well be considered to have evolved from an early-specialized great branch of the Cidaroid stem. On the other hand, it remains a question whether the species may be regarded to have a common ancestor with the regular echinoid branch including the Stirodonta[10] which Mortensen (1934, 1935) regards as derived from the Cidaroid stem.

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Explanation of plates

Plate V(I).

Psychocidaris ohshimai IKEDA; Figs. 1–7, globiferous pedicellaria and its valves; Figs. 8–14, tridentate pedicellariae, the large (Figs. 8–10) and the small (Figs. 11–14), and their valves; all figures magnified.

Fig. 1. Head and part of stalk; ×30.
Fig. 2. Interior view of valve; ×60.
Fig. 3. Part of valve, with apophysis and partition-wall. The wall divides the inside of the valve into two parts, the blade and the base; ×50.
Fig. 4. Slightly oblique interior view of valve; ×60.
Fig. 5. Part of valve, with external thorns at one edge; ×120.
Fig. 6. Part of valve, with external thorns and part of lateral teeth; do.
Fig. 7. End teeth and part of lateral teeth of same valve; do.
Fig. 8. Head and part of stalk of large one; ×30.
Fig. 9. Interior view of valve; ×60.

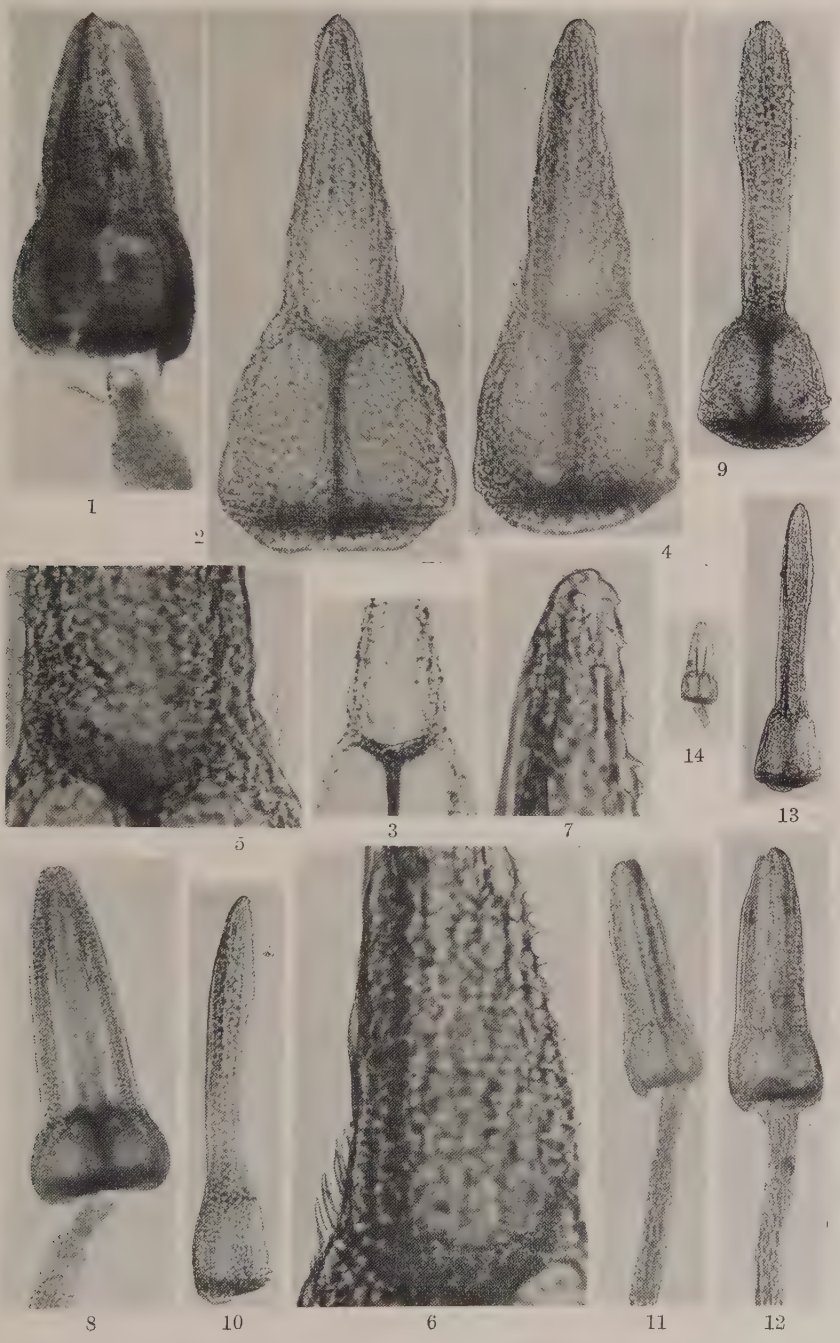
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Fig. 10. Slightly oblique interior view of another valve; do.
Fig. 11. Head and part of stalk of small one; do.
Fig. 12. Another head, with part of stalk; do.
Fig. 13. Slightly oblique interior view of valve; do.
Fig. 14. Head and part of stalk of another small one; ×45.

Plate VI(II).

Sections of the globiferous pedicellaria in *Psychocidaris ohshimai* IKEDA (Figs. 1–11) and in *Plococidaris verticillata* (LAMARCK) (Figs. 12, 13); all figures magnified.

Fig. 1. Section of head and stalk from a dry specimen; the longitudinal section (18μ) is near the end of the series; ×30.
Fig. 2. Valves, with peculiar cells on the inside; the longitudinal section (12μ) is near the end of the series; do.
Fig. 3. Part of same section showing cells and connective tissues; ×100.
Fig. 4. Valves, with cells on the inside; another section of the same series; ×45.
Fig. 5. Part of same section showing adductor muscles and connective tissues of base; ×100.
Fig. 6. Valves showing the layer formed by peculiar cells on the inside; the longitudinal sections (10μ) being cut somewhat obliquely; ×120.
Fig. 7. Part of same section showing the left-side layer; ×190.
Fig. 8. Transverse section of base of head, showing adductor muscles; the section (12μ) is near the end of the series; ×50.
Fig. 9. Longitudinal section (10μ) of part of head and stalk, showing flexor and extensor muscles and connective tissues; ×120.
Fig. 10. Part of same; ×480.
Fig. 11. Slightly oblique longitudinal section (10μ) of stalk, showing the epithelium; ×120.
Fig. 12. Longitudinal section (16μ) of head, with part of stalk; ×50.
Fig. 13. Part of another section of same series, showing poison gland cells in left-side of valve; ×300.

A New Genus and New Species of the Cidaridae from the Bonin Islands (Cidaroida)[1]

By

Hayato Ikeda

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(With 4 Plates)

In March 1938, specimens of echinoids were sent by Mr. Yusaku Matida, former director of the Ogasawara (Bonin Islands) forestry office, under the jurisdiction of the Tokyo Forestry Bureau. According to him, these examples were collected at Kaikata, where the water was 70–80 fathoms in depth, by the captain[2] of the Kaikō-maru belonging to the Ogasawara branch of the Tokyo prefectural office. Kaikata is a fishing ground, south-west of Titi-zima or south of Nisi-no-sima: 26°40′N., 140°55′E. Among the specimens of the Cidaroida[3] included in the collection, there were two individuals whose peculiar bright vermilion spines and beautiful general appearance arrested my attention. A close examination has convinced me to regard them as new to science, as will be described hereunder.

I should like to offer my heartiest thanks to Professor Hiroshi Ohshima for his generous aid given me during the work. My thanks are also due to Mr. Matida and the captain, who placed the collection at my disposal .

Compsocidaris, gen. nov.

Test sparsely tuberculate. Some of upper tubercles with traces of crenulation. Areoles rather shallow, two proximal ones confluent.

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1) Contributions from the Zoological Laboratory, Kyûsyû Imperial University, No. 127. A part of the expense for the present work was provided from the research fund of the Imperial Academy.

2. In life, according to the captain, the spines were conspicuously vermilion in colour.

3. Mortensen (1935, p. 26) in Part II of his monograph gave this order the name of "Cidaroida," rectifying "Cidaroidea" of Part I of his monograph (1928).

Pores subconjugate. Primary and secondary spines conspicuously vermilion. Large and small globiferous pedicellariae subterminal, lacking the end tooth.

Genotype: *Compsocidaris pyrsacantha,* sp. nov.

Compsocidaris pyrsacantha, sp. nov.

Shape of test rather high, more flattened in the upper part than in the lower, the oral side slightly arched, the circumference round. Horizontal diameter 52–55 mm, vertical diameter 39–40 mm.

Ambulacra sinuate, narrow, about 20 per cent of the width of the interambulacra. The interporiferous zone is a little wider than, and somewhat elevated above, the pore zone. The marginal series of the secondary tubercles are very regular, the tubercles being rather small and low. Much smaller tubercles are found, each in the lower corner of the plate and near the median line of the zone, forming a regular vertical series on either side of the median. The median line is slightly sunken. The pores subconjugate, about equal in size, nearly horizontal, rather wide apart, with a broad wall between them; the ridge low, nearly flat.

Usually seven interambulacral plates form a series. Primary tubercles quite round, crenulation is slightly observable on some of the upper tubercles. Areoles large, rather shallow, at most the two proximal ones confluent. The edge of areoles not elevated; the scrobicular tubercles not conspicuous. Outside the scrobicular ring the plates are sparsely covered with secondary tubercles which decrease gradually in size towards the mid-line of the area, as well as towards the horizontal sutures and the sutures contiguous to the pore zone. Impression in the horizontal sutures of the upper plates distinct. The median area about half as wide as an areole, only slightly sunken towards the mid-line; the plates, on the whole, flat.

Apical system 46–52 per cent h. d.; in the type specimen the oculars triangular, all inserted, though not broadly so. The madreporite not enlarged. Genital pores small, nearer the outer edge. Both the ocular and genital plates very bare, mainly with a series of secondary tubercles along the outer and inner edges. The periproct consists of fairly numerous small plates, also rather sparsely covered with secondary tubercles somewhat larger than those on the ocular and genital plates.

Peristome slightly smaller than the apical system, somewhat protruding. In the type specimen 16–17 ambulacral plates form a series,

while 7–8 interambulacral plates form a fairly regular single series, reaching almost to the mouth edge.

Primary spines rather smooth, long, fairly thick, somewhat tapering; ambital primaries about twice as long as the horizontal diameter. The shaft with 24–28 longitudinal lines, which form conspicuous ridges towards the end; some of the lines are composed of small warts regularly arranged in longitudinal rows. The neck fairly conspicuous, about 6 mm in thickness. The collar is 2.5–3.5 mm long, perceptibly increasing in thickness towards the fairly prominent milled ring. Oral primaries simply club-shaped, not flattened nor curved, but rather strongly furrowed along nearly the whole length. The second oral primary is similar to the first one, only longer, and the third is still longer, indicating the tendency of transition to the ambital spine. The low space between the longitudinal lines of the shaft is covered with a spongy texture. The holes of the internal structure of the primary spines are arranged in a characteristically irregular way, somewhat like the veins of a leaf, in the distal half, and in a markedly less irregular way in the proximal half; the irregularity of the holes becomes more conspicuous towards the end of the spines. Secondary spines flattened, somewhat narrow towards the slightly rounded ends. The scrobicular spines long, about 6 mm in length. The marginal ambulacral spines about 4 mm long. The mamelonate secondaries pointed.

Large globiferous pedicellariae numerous, especially among the scrobicular spines. The valves fairly slender, very thin, 0.74–0.84 mm long. The opening subterminal, small; the end of the valve is slightly prolonged, forming a shallow groove; often, however, it lacks the groove, assuming the shape of a fork, like the opening of *Homalocidaris gigantea* (H. L. Clark) figured by Mortensen (1928, Pl. LXXVII, Fig. 14). This may be due to the peculiar deficiency of the calcareous matter at the end. There is no end tooth. The lower lip simple. The stalk long, 3–4 mm in length. The small globiferous pedicellariae not very numerous, found mainly in the ambulacral zone. The head small, 0.3–0.54 mm long; the valves of nearly the same shape as those of the large globiferous pedicellaria. The large and small tridentate pedicellariae have very slender, narrow, straight valves, which of course vary considerably in size, the length of the valves ranging between 1–1.8 mm.

Colour: both in dried and alcoholic specimens the test yellowish white; the primary tubercles and the areoles pink; the secondary tubercles on the periproctal plates dull pink. In the dried specimen and

the one preserved in alcohol the primary spines dark vermilion, somewhat lighter or duller towards the end; the milled ring dark brown, the collar conspicuously vermilion; the scrobicular secondary spines also bright vermilion, though more or less whitish near the base; the marginal ambulacral spines have a vermilion-coloured median stripe, and are white at the base and gradually darker towards the end. The secondary spines on the apical system and the periproctal plates are of about the same coloration as the scrobicular spines; the secondaries in the median area of the interambulacra are more whitish at the base than the other secondaries. This peculiarity of the secondaries, together with their sparseness and smallness, makes the median areas appear nearly bare. The globiferous and tridentate pedicellariae pink.

The two specimens described above were added to the collection of the Zoological Laboratory, Kyûsyû Imperial University.

The present form may be brought under the group designated by MORTENSEN (1928, p. 225) as Stereocidarina, as it lacks the end tooth on the valves of the large and small globiferous pedicellariae. According to him, the group comprises three genera, one recent *Stereocidaris* and two fossil *Temnocidaris* and *Sinaecidaris*. My form, however, seems to be distinct from these three genera in that the tuberculation is sparse while it is close in the other three. In the characters of the test, however, my form shows a close resemblance to *Stereocidaris* rather than to any other genera of the group.

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Explanation of plates

Plate VII(I).

Compsocidaris pyrsacantha, gen. et sp. nov.; Figs. 1, 2.

Fig. 1. Abactinal view of type specimen denuded partly; somewhat enlarged.

Fig. 2. Actinal view of same; do.

Plate VIII(II).

Compsocidaris pyrsacantha, gen. et sp. nov.; Figs. 1, 2.

Fig. 1. Abactinal view of another specimen; slightly reduced.

Fig. 2. Actinal view of same; do.

Plate IX(III).

Compsocidaris pyrsacantha, gen. et. sp. nov.; Figs. 1–4.

Fig. 1. Side view of type specimen denuded partly; somewhat enlarged.

Fig. 2. Abactinal side of same, showing apical system and periproctal region; ×2.5.

Fig. 3. Part of cross section at distal part of primary spine; ×45.

Fig. 4. Part of cross section at proximal part of primary spine, showing outer structure; do.

Plate X(IV).

Compsocidaris pyrsacantha, gen. et sp. nov.; Figs. 1–13.

Fig. 1. End of valve of large globiferous pedicellaria showing ventral side; ×45.

Fig. 2. Part of same; ×300.

Fig. 3. End of valve of large globiferous pedicellaria showing ventral side; ×45.

Fig. 4. Part of same; ×300.

Fig. 5. Half side view of valve of large globiferous pedicellaria; ×45.

Fig. 6. Head and part of stalk of globiferous pedicellaria of intermediate size between large and small ones; do.

Fig. 7. Head and part of stalk of small globiferous pedicellaria; do.

Fig. 8. Head and part of stalk of another small globiferous pedicellaria; do.

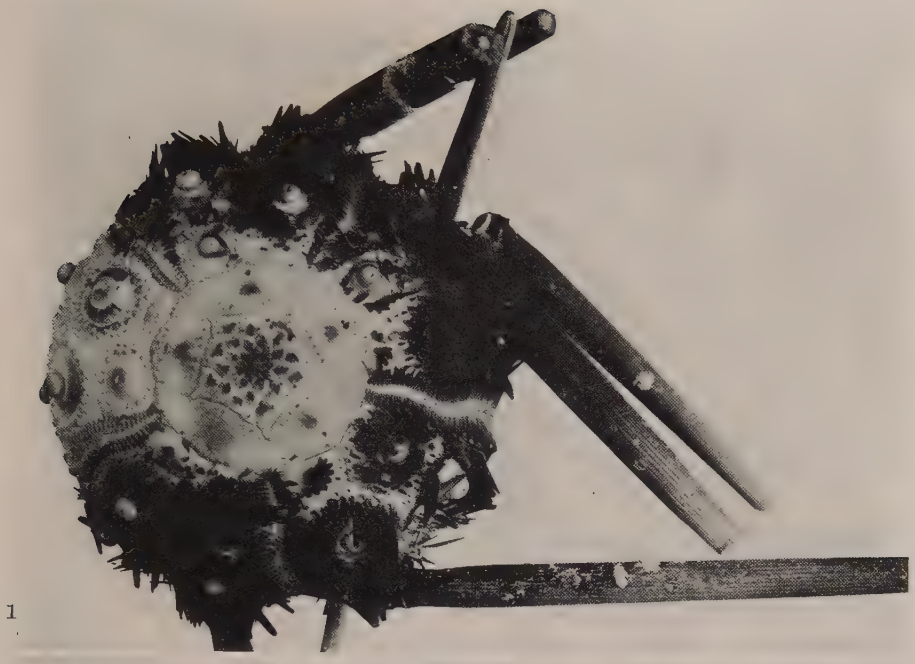
Fig. 9. Head and part of stalk of large globiferous pedicellaria; do.

Fig. 10. Head and part of stalk of small tridentate pedicellaria; do.

Fig. 11. Head of large tridentate pedicellaria; do.

Fig. 12. Part of surface of scrobicular spine; do.

Fig. 13. Part of surface of primary spine; do.



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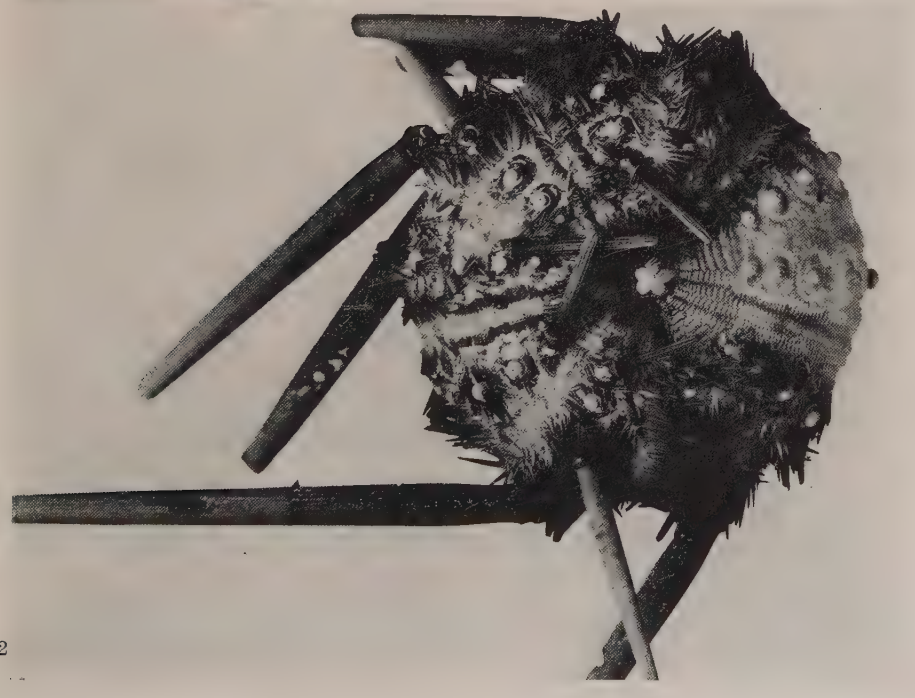

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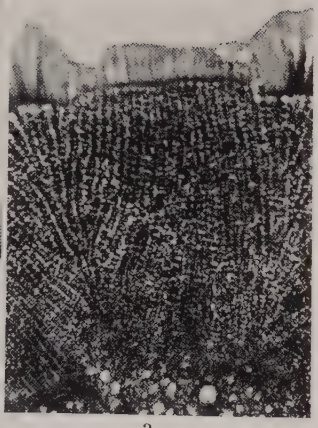

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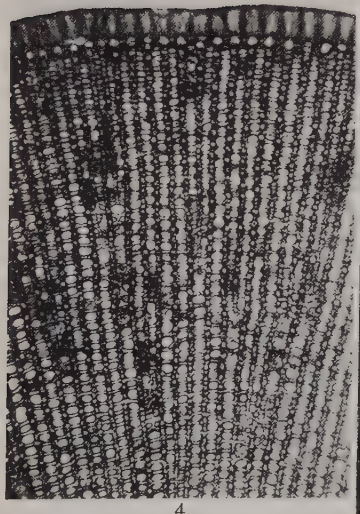

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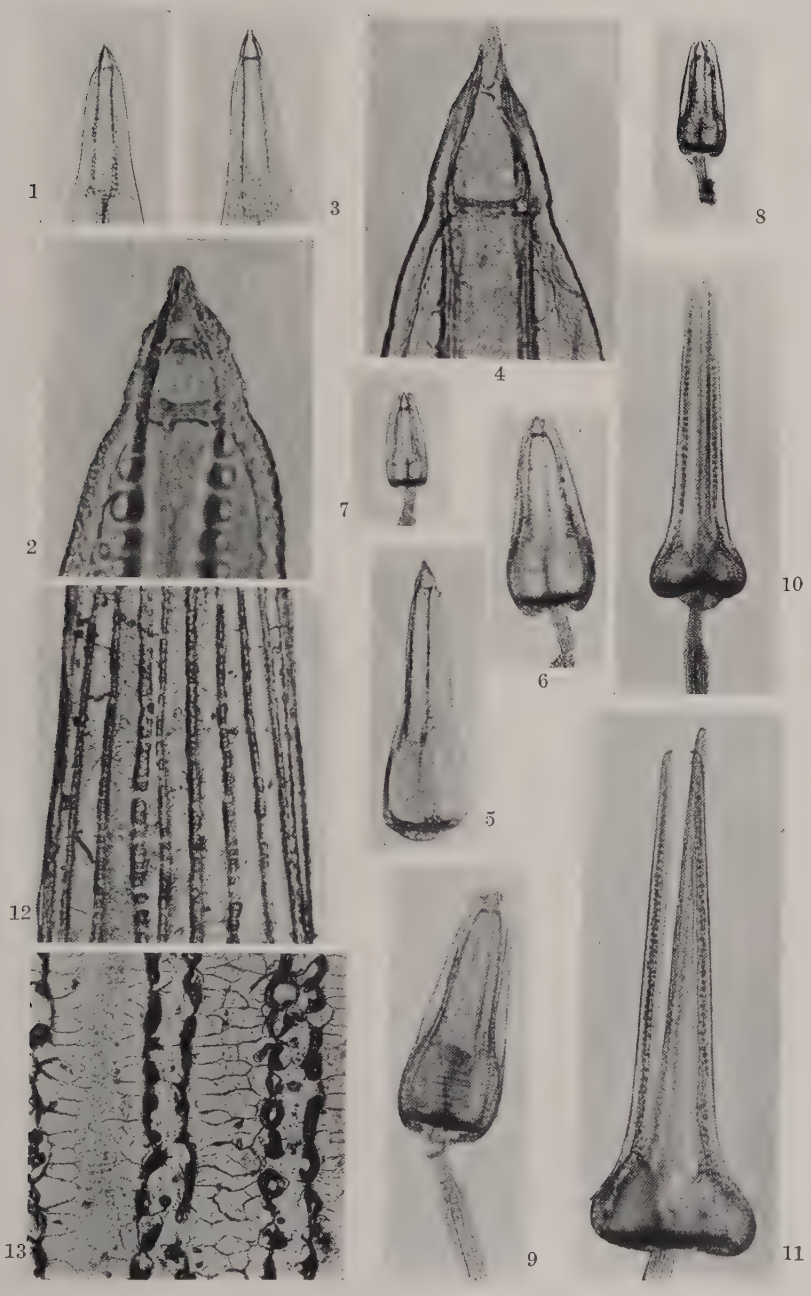
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A New Species of *Diadema* from Japan[1)]

By

Hayato Ikeda

Zoological Laboratory, Kyûsyû Imperial University, Hukuoka

(With 1 Plate)

Test low, being less than half of the horizontal diameter in height; usually brownish in colour. Ambulacra wider than interambulacra by one-third of the latter. Diameter of abactinal system more than half that of actinostome. Primary tubercles conspicuous; second series of interambulacral primary tubercles begins abactinally on 5th or 6th coronal plate. Primary spines comparatively stout, with about 18–21 longitudinal series of teeth. Primaries and secondaries light green in colour, banded with purple. Longest spine does not exceed 10 cm. Miliary spines numerous. Tridentate pedicellariae very rare; valves slender, compressed; marign of the valves dentate, the tip curved, narrow.

Further distinguishing characters are found in the five white streaks running along the middle of the naked space of the interambulacral zones. In the living animal also these are seen as white, or rarely red, streaks. These streaks often look something like white grooves on the test.

Colour in life: The aboral side is reddish-purple except for the spines which are greenish. Even in small individuals the white streaks are evident. The whole oral region is red and reddish-white. The end of the anal tube is orange as in *D. setosum*. In dry specimens these colorations often disappear as in those preserved in alcohol.

Locality and habitat: Tomioka, Kumamoto-ken; Tusima, Nagasaki-ken; Oki-no-sima, Hukuoka-ken. 22 specimens were collected by myself in shallow waters of these localities in the years 1933 and 1934. The largest specimen is 65 mm long in horizontal diameter. The specimens from Tusima occurred near the low tide mark in a calm gulf,

1) Contributions from the Zoological Laboratory, Kyûsyû Imperial University, No. 128.

together with *Strongylocentrotus nudus,* but entirely separated from *D. setosum.* In Tomioka also, this species lives clearly separated from the species *setosum* by a headland which forms a bay, the Tomoe-wan. It occurs side by side with *Parasalenia gratiosa* var. *boninensis*[2] inside the bay where the water is very calm, whereas *setosum* aggregates under the shelter of blocks of stone on the other side of the headland where the water is not always still.

The type specimen is kept in the Zoological Laboratory, Kyûsyû Imperial University.

Among those specimens from Japan which CLARK (1908, 1925) describes as *setosum,* there may have been some referable to the present species. For he says in 1908: "The young *Diadema* from Japan, in the OWSTON collection, is a very remarkable looking specimen, and I shall not be surprised if it proves to belong to an undescribed species" (p. 302). And again in 1925: "This additional material from Japan leaves me as perplexed as ever. The smallest example is a lovely little violet and yellow-green individual such as I described. The others (6) are reddish and reddish-white in colour, with the primary spines banded as usual in young *Diademas*; the tests are 50–60 mm. in diameter, and *the second series of the interambulacral tubercles begins on 5th or 6th coronal plate,*[3] not on the 7th or 8th, as is usual in this species (*setosum*). One of the specimens shows the interambulacral white spots clearly, but the others indistinctly or not at all; in all, however, the peristome is reddish-white. No perfect tridentate pedicellariae of normal size were found, but one broken one and one very small one had the valves narrow and compressed. I think it probable that the Sagami Bay *Diadema* is an undescribed species, but until adult specimens are procured it would be foolish to try to separate it from *D. setosum*" (p. 44). MORTENSEN (1904, p. 10) and CLARK (1921, p. 146) observed the white spots only in *setosum* and regarded them as a specific character, though AGASSIZ and CLARK (1907) said nothing about them. In the case of my *species* the white marking is in the shape of streaks instead of spots which are usual in *setosum.*

2) The variety *boninensis* in shallow water inside Tomoe-wan does not hide itself under stones, as is usual in this variety in the Bonin Islands. In the variety which is found in a depth of about 7 fathoms outside Tomoe-wan, the reverse is the case; that is, the *boninensis* conceals itself in Madreporaria in the outside of the bay as it does in the said subtropical locality.

3) The Italics are mine.

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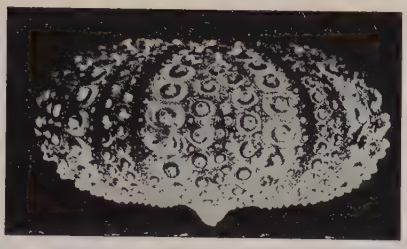

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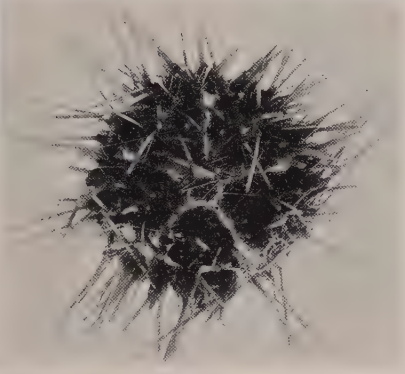

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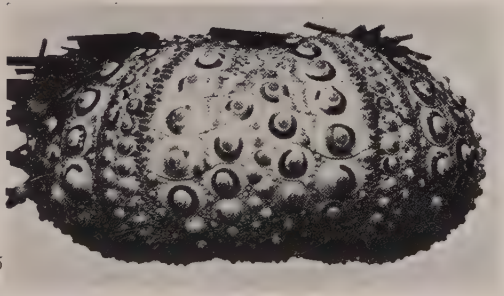

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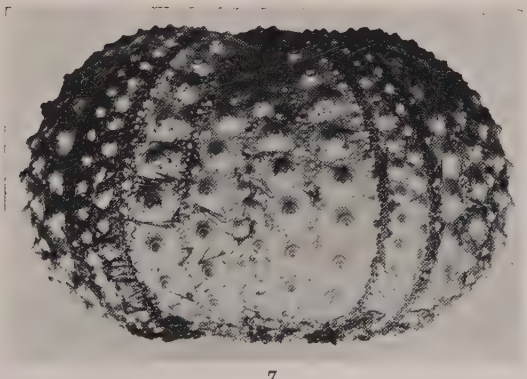

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So far as can be judged from the test alone, my form appears rather near the species *savignyi* than any other species of *Diadema*. But it differs even from *savignyi* which has no white streaks in the middle of the naked space of the interambulacral zones, as AGASSIZ and CLARK (1907) described and as I have ascertained in the Ryûkyû and the Ogasawara (Bonin) specimens in the possession of our Laboratory. In the shape of tridentate pedicellariae my species somewhat resembles *setosum*. But it seems to be clearly distinguishable from the latter, as, in my species, the second series of the interambulacral primary tubercles begins on the 5th or 6th coronal plate, not on the 7th or 8th as in *setosum*.

The present species is named after Dr. HUBERT L. CLARK who, I suppose, has before him specimens referable to the species, and has already taken notice of some peculiarities in them, as cited above.

I should like to acknowledge my indebtedness to Professor HIROSHI OHSHIMA for his kind guidance.

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Explanation of plate

Plate XI(I).

Diadema clarki, sp. nov., Figs. 1–4; *Diadema savignyi* MICHELIN, Figs. 5, 6; *Diadema setosum* (LESKE), Fig. 7.

Fig. 1. Abactinal view of denuded test; slightly reduced.
Fig. 2. Side view of same; do.
Fig. 3. Abactinal view of smaller individual with spines; do.
Fig. 4. Part of surface of primary spine; ×45.
Fig. 5. Side view of partly denuded test; ×1.
Fig. 6. Part of surface of primary spine; ×45.
Fig. 7. Side view of denuded test; ×1.

Notes on Crustacea Brachyura Collected by Professor Teiso Esaki's Micronesia Expeditions 1937-1938 Together with a Check List of Micronesian Brachyura[1)]

By

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(With 6 Plates, 13 Text-figures and 1 Table)

Biological expeditions to the Micronesia were made by Professor Teiso Esaki during the years 1936–1938. In the first issue of the series of my paper, some Decapod Crustaceans collected in the first expedition were described. I shall here report on the Brachyura in the collections of the second expedition comprising 28 species, of which 2, namely, *Xenocarcinus esakii* and *Parazewa palauensis*, are new to science. Further, 2 species are for the first time noted as belonging to the fauna of Micronesia. Besides these 8 more species from other sources are added in the list in Part II as new to the fauna.

The Brachyuran Decapod fauna of Micronesia was dealt with fragmentarily by several authors including Balss (1922, 1938), Bürger (1893, 1895), Doflein (1904), Hiro (1936, 1937), Horii (1916), Jacquinot et Lucas (1853), de Man (1889, 1890), Miyake (1938), Odhner (1925), Ortmann (1893, 1894), Parisi (1916, 1918), Rathbun (1907), Safford (1905) and Sakai (1936). The list in Part II is primarily an attempt to survey the extent of the systematic work done in the past on the Micronesian carcinological fauna. At the same time, it may give an idea as to how much is yet to be done.

I desire to take this opportunity of expressing my obligation to the following gentlemen, from whom I have received valuable assistance. I am especially indebted to Prof. T. Esaki, for having kindly granted

1. Contributions from the Zoological Laboratory, Kyūsyū Imperial University, No. 129. Results of Professor Teiso Esaki's Micronesia Expeditions 1936–1938, No. 18.

me the opportunity to study the interesting material collected in his expeditions and for his valuable suggestions and criticisms. My thanks are due to Prof. Hiroshi Ohshima who has provided me with facilities required for the pursuit of this work, and has kindly revised the manuscript. I express my thanks also to Messrs. T. Yamanouchi, F. Hiro and S. Murakami, for placing the materials in my hands for study. I am greatly obliged to Prof. H. Balss, Dr. I. Gordon, Dr. M. J. Rathbun, Mr. T. Sakai and Dr. W. L. Schmitt, for their suggestions and sending me valuable papers not accessible to me. To Mr. M. Fujino who has given his own time to some of the photographs of the plates, I can but offer my thanks.

The localities of the collection are given below.

I. Mariana Islands

1. Saipan.
2. Rota.
3. Guam.

II. Palau Islands

1. Ngáruangel Atoll (Garuangeru Syō) 134°39′E., 8°10′N.
2. Ngaregúr Island (Garukōru Tō) 134°38′E., 7°45′N.
3. Ngarekeklau Island (Garakakurao I.) 134°37′30″E., 7°44′20″N.
4. Babldáob Island (Babeldaop, Babelthaob, Baberudaobu).
   i. Ngatmél, Negregolóng, Babldáob I. (Gatumeru) 134°38′E., 7°43′N.
   ii. Ngarsmau, Babldáob I. (Garasumao) 134°33′E., 7°37′N.
   iii. Melekéiok, Babldáob I. (Marukyoku) 134°38′30″E., 7°29′N.
5. Ngarekobasáng Island (Arakabesan I.).
   Ngarekobasáng passage 134°27′40″E., 7°20′30″E.
6. Goréor Island (Korror, Korōru).
   i. Ngarekamâis, Goréor I. (Korōru-Harbour) 134°29′E., 7°21′N.
   ii. S.W. Madalâi, Goréor I. (Madarai) 134°28′E., 7°20′30″N.
   iii. Ngarbagéd, Goréor I. (Arabaketu) 134°28′40″E., 7°19′40″N.
   iv. Toágel Mid [Ngarmid passage] (Arumizu passage) 134°30′E., 7°22′N.
   v. Songél a Lise (Iwayama Bay).
      a) Hayasi-zima (I).
      b) Gasapsum Islet (Takonoki-zima) (II).
      c) Ngasasaker Islet (Nisi-naka-zima) (XVIII).

d) Ngaláp, Songél a Lise (Kaki passage) 134°30′E., 7°21′N.

7. Ngargól Island (Garangoru I.) 134°26′20″E., 7°20′20″N.
   i. Rëgúio passage [Ngargól Is.-Ulpságel I.] (Regio passage) 134°27′10″E., 7°20′10″N.
8. Ulupságel Island (Oropsyakaru I.).
   i. Ngaregelngáel, Ulupságel I. (Geruherugairu) 134°29′30″E., 7°19′10″N.
9. aUgulpelú Reef, aUgulpelú Island (Augulupelu) 134°32′E., 7°17′20″N.
10. Malagál Harbour, Ngurkdápel Island (North of Urukutâburu I.) 134°27′30″E., 7°18′N.
11. Ngadarák Reef (Gadarak Syō) 134°28′30″E., 7°17′30″N.
12. Ngaiánges Island (Kayangus I.) 134°23′E., 7°12′25″N.
13. Peliliou Island.
   i. aGológel, Peliliou I. (Akarrokuru) 134°16′E., 7°2′30″N.
   ii. Ngaregól, Peliliou I. (Garegoru) 134°15′E., 7°1′20″N.
   iii. Ngarageúkl, Peliliou I. (Garukyokuru) 134°14′E., 7°N.
14. aNgeaur Island (Angaur, Augauru).

III. Tokobei Islands

1. Tokobei Island, Tokobei Islands.

IV. Caroline Islands

1. Yap.
2. Truk (Ruk, Ruck).
   i. Wela Islet (Mela, Huru-sima).
   ii. Taloas Islet (Toloas Is., Natu-sima).
3. Ponape (Ponapé, Ponapi).
   i. Kiti (Kitti), Ponape.
   ii. Nat (Nott, Nöt, Nutt).
   iii. Laňar Island (Langar I.), Ponape.
4. Kusaie.
   i. Malem, Kusaie.

V. Nauru Island

VI. Marshall Islands

(I) Ralik-Group

1. Kwadjelin (Kwadelin, Kwajelin).

2. Namo (Namu).
3. Ailinlablab (Ailinglaplap).
4. Jaluit (Jalut).
5. Namrik (Namorik).
6. Ebon.

(II) Ratak-Group

1. Likieb (Ligiep).
2. Medjeru (Mejru).
3. Arno (Aruno, Aino).

VII. Gilbert Islands

1. Makin (Markin).
2. Taritari (Butaritari).
3. Apaiang (Apiang).
4. Tarawa.
5. Apamama (Apemama).
6. Aranuka.
7. Nonuti (Nonouti).
8. Tapeteuea (Tapitoea, Taputeuea).
9. Nukunau (Nukunoa).
10. Beru (Peru).
11. Tamana.
12. Arorai (Arari).

Part I.

Notes on Crustacea Brachyura collected by Professor Teiso Esaki's Micronesia Expeditions 1937–1938

PORTUNIDAE

1. *Thalamita coeuleipes* Jacquinot et Lucas

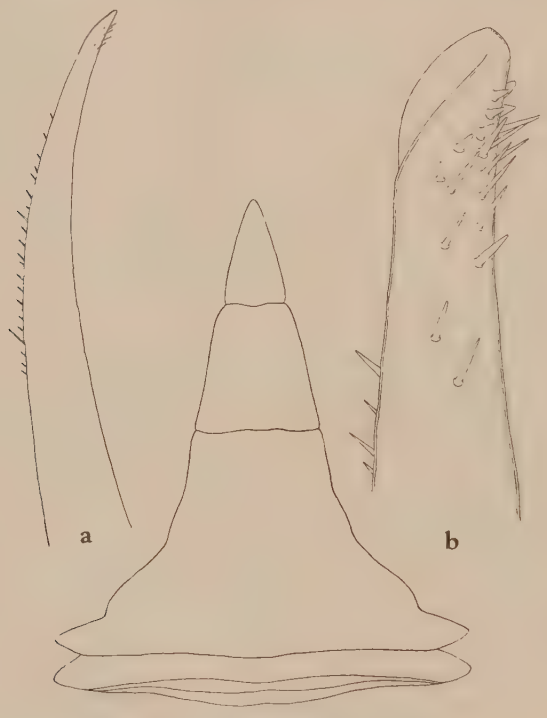
Plate XII(I), fig. 1; text-fig. 1.

Thalamita coeuleipes Ortmann 1894, p. 744—Caroline Is.
——— Balss 1938, p. 33—Beru, Aranuka (Gilbert Is.).

Material examined. 1 male, 1 ovig. female; Kusaie: Malem.
Dimensions (in mm).

	male	female
Breadth of carapace	48	37.5
Length of carapace	32.5	26.5

Remarks. The ridge on the basal segment of the antenna is armed with two (in female) or three (in male) acute spines; they are partially seen between the supra-orbital lobe and the outer frontal (the third)



Text-fig. 1. *Thalamita coeuleipes*

a. anterior male abdominal appendage, ×12.5.
b. distal part of the same, ×60.
c. abdomen, ×3.5.

lobe. The five antero-lateral teeth of the carapace are successively decreasing in length. The chelipeds are nearly equal, right one being larger in both sexes. The anterior margin of the arm presents four spines, of which the proximal and distal ones are very small. The wrist bears a strong acute spine at its internal angle, and the outer surface is armed with three spines. The palm is armed with five spines, arranged in two rows on the upper margin. Two spines are on the inner row, but three on the outer one. The abdomen and the anterior abdominal appendage are as illustrated in the text-figures.

2. *Thalamita crenata* Latreille

Plate XII(I), fig. 3.

Thalamita crenata Sakai 1936, p. 161, Pl. 12, fig. 2—Palau Is. (Caroline Is.).
——— Balss 1938, p. 32—Aranuka, Nonuti (Gilbert Is.).

Material examined. 3 males; Truk: Taloas (Natu-sima); Jan. 21, 1938.

3. *Thalamita integra* Dana

Plate XII(I), fig. 2; text-fig. 2.

Thalamita integra Parisi 1916, p. 179—Truk (Caroline Is.).
——— Balss 1938, p. 33—Aranuka (Gilbert Is.).

Material examined. 1 male, 1 female; Palau Is.: Korror; Feb. 2, 1938.

Dimensions (in mm).

Text-fig. 2. *Thalamita integra*

a. right oculo-antennal region, ventral view, ×3. b. anterior male abdominal appendage, ×15. c. distal part of the same, ×60.

	male	female
Length of carapace	16	12.5
Breadth of carapace	26	20
Fronto-orbital length	16	12.5

Remarks. The carapace is rather convex. The proportion of the length to the breadth is 1:1.6. The length of the carapace is just equal to the fronto-orbital length. The frontal margin cut into two lobes excluding the inner supra-orbital lobe. The frontal margins are not straight, forming a slightly convex curve. The upper surface of the carapace is smooth and polished. The transverse ridges are well distinct.

The antero-lateral margin is divided into five teeth including outer orbital lobes; the fourth tooth is rudimentary. The supra-orbital angle is almost straight, not much narrower than either of the frontal lobes. The crest of the basal segment of the antenna is smooth and has a sharp entire edge.

The chelipeds are unequal in both sexes. The surface is smooth; the merus is armed with three spines on the anterior margin distally; the wrist is armed with three spines at the outer angle; the palm is furnished with crest-like ridge on the inner border and bears two teeth on the ridge. There is a small spine in front of the apex of the wrist-joint, and in front of this spine is one tubercle in both sexes. A smooth ridge runs along the lower border of the palm.

The sixth abdominal segment of the male is much broader than long. The anterior male abdominal appendage is illustrated in text-figures.

4. *Scylla serrata* Forskål

Plate XVI(V), fig. 5.

Scylla serrata Sakai 1936, p. 162—Palau Is.
——— Miyake 1938, p. 109—Palu Is.: Peliliou Is.

Material examined. 1 female; Ponape: Nat; Dec. 30, 1937.

XANTHIDAE

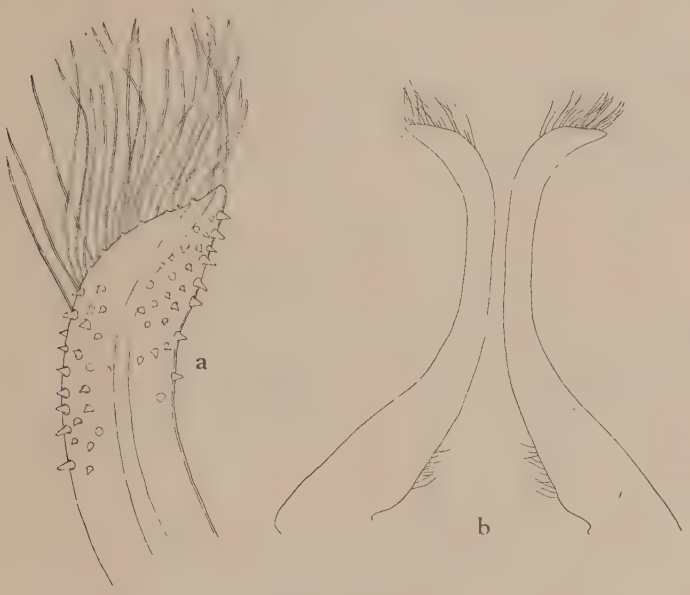
5. *Carpilodes bellus* (Dana)

Plate XIII(II), fig. 9; text-fig. 3.

Actacodes bellus Dana 1852, p. 196, Pl. 11, fig. 2.
Carpilodes bellus Odhner 1925, p. 16, Pl. 1, fig. 9—Ponape (Caroline Is.). Ralik

Is.: Jaluit, Ebon; Ratak Is.: Likieb (Marshall Is.). Aranuka, Apamama, Tapeteuea, Tamana, Arorai (Gilbert Is.).

Material examined. 1 female; Kusaie: Malem; Dec. 20, 1937. 6 males, 4 females; Kusaie: Malem; Dec. 21, 1937.



Text-fig. 3.
Anterior male abdominal appendage of *Carpilodes bellus*
a. ×60. b. ×10.

Remarks. The carapace is convex and ornamented with fine granules on the whole upper surface, but not so prominent as in *Carpilodes rugatus* (H. Milne-Edwards). The proportion of the length to breadth is 1:1.65. The fronto-orbital length is just one third the breadth of the carapace. The areolets of the carapace are few and low. There is a distinct groove between 1 M and 2 F, but no groove between 1 M, 2 M and 1 F, 2 F respectively. The 2 M lobe is partially divided longitudinally. The lateral margin is divided by three furrows into four lobes, of which the three posterior are prominent, rounded and their lobes are continued inward to a large area of L-regions. 1 L, 2 L and 3 L are not separated from each other; a little depression can be seen on the small region known as 1 L, 4 L, 5 L and 6 L are completely combined into one lobe. The front is vertical, bilobed and

rounded. The orbital margin is not so prominent; the outer orbital angle is not distinguished from the first antero-lateral lobe.

The chelipeds are unequal in both sexes. The outer surface of the wrist is granulose and rugulose. The palms are ornamented with three granular ridges on its outer surface. There is a distinct groove upwardly parallel with these ridges. The fingers are short, stout and armed with teeth on the inner margin. The tips of the fingers are in contact with each other and are spoon-shaped. The ambulatory legs are compressed and granulose. The upper surface of the propodus has a longitudinal depression on the upper surface.

The abdomen of the male is seven-jointed.

6. *Platypodia granulosa* (Rüppell)

Plate XIV(III), fig. 3; text-fig. 4.

Xantho granulosus Rüppell 1830, p. 24, Pl. 5, fig. 3; Pl. 6, fig. 18—Red Sea.
Platypodia granulosa Sakai 1936, p. 163, Pl. 14, fig. 2—Palau Is.
Platypodia granulosa Balss 1938, p. 37—Aranuka (Gilbert Is.).

Material examined. 1 male; Truk: Taloas (Natu-sima); Jan. 21, 1938.

Dimensions (in mm).

Breadth of carapace	42
Length of carapace	28
Fronto-orbital length	14

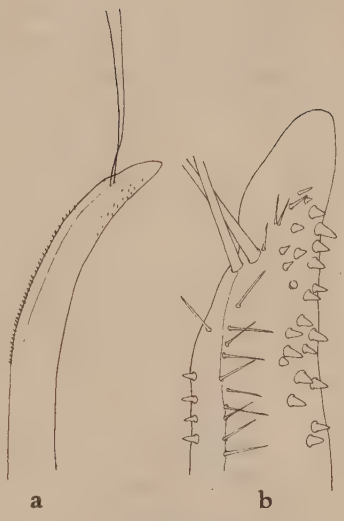
Coloration. The dorsal surface of the body is apricot orange and light english red. The ventral surface is whitish.

Description. The carapace is convex in both directions; the upper surface is furnished with peal-like granules and pubescent. The proportion of the length to the breadth is 1:1.5. The fronto-orbital length just equals one third the breadth of the carapace. The front is divided into two lobes; the median groove is not distinct and the frontal lobes are in contact with each other. The frontal margin is slightly undulate; its exterior angle is separated from the inner orbital angle by a V-shaped notch. The orbital edge is dilated; there is two fissures on upper edge. The lower edge has a broad V-shaped sinus at the middle. The anterolateral margin is armed with four lobes; each lobe has an independent crest-like edge. The first lobe is fused into the orbital edge. The basal segment of antena is broad and short; the flagellum is lodged in the orbital hiatus.

The areolets of the carapace are as follows. Reticulating grooves

of regions are deep in the anterior half. 1 F, 2 F, 1 M, 2 M, 3 M, 1 L, 2 L and 3 L are well defined respectively. 4 L, 5 L and 6 L are separated from each other, but the delineating groove between these lobes and R-lobes is not distinct. In the rest of the carapace the grooves are not distinct, so that R- and P-regions are not subdivided.

The chelipeds are equal. The arm is very short and has a simple sharp crest on upper surface. The wrist is armed with two obtuse teeth on its inner edge of distal margin. The palm has no crest-like margin on the upper margin. The fingers bear some stout teeth on their inner margins; the tips of the fingers are pointed where they come in contact with each other. There is a slight gap between the fingers. The crest-like margin of the upper border of the movable fingers is somewhat eroded in my specimen. The surfaces of the wrist and the palm are furnished with the same granules as in the carapace.



Text-fig. 4.
Anterior male abdominal appendage of *Platypodia granulosa*
a. ×24. b. ×60.

The ambulatory legs are strongly compressed. The merus, carpus and propodus have crest-like margin on their anterior border.

The abdomen of the male is five-jointed, the third-fifth joints being fused.

7. *Zozymodes pumilus* (Jacquinot et Lucas)

Plate XIII(II), fig. 2; text-fig. 5.

Xanthodius cristatus Rathbun 1907, p. 41—Ponape (Caroline Is.).
Zoozymodes pumilus Balss 1938, p. 39—Apamama (Gilbert Is.).

Material examined. 1 male, 1 female; Kusaie: Malem; Dec. 22, 1937.

Dimensions (in mm).

	male	female
Breadth of carapace	5	5.5
Length of carapace	3	3.5
Fronto-orbital length	1.7	2

Text-fig. 5.
Anterior male abdominal appendage of *Zozymodes pumilus*
a. ×60. b. ×25.

Coloration. The whole body is of light fawn colour. The upper surface of the carapace is ornamented with three longitudinal bands of ochre reddish colour; the ambulatory legs are also of the same colour, but the dactyli are whitish. The fingers of the chelipeds are brown.

Remarks. As the specimens are young the regional lobes are not separated distinctly. This species has the crest and furrow at the usual place on the palm of the cheliped. In the female the furrow is not so distinct, but shallow and granulose.

8. *Xantho* (*Leptodius*) *danae* Odhner

Plate XIV(III), fig. 4.

Xantho exaratus var. *nudipes* Ortmann 1893, p. 447—Ponape (Caroline Is.).
Xantho danae Odhner 1925, p. 80.
Xantho danae Balss 1938, p. 41—Jaluit (Marshall Is.). Tapeteuea (Gilbert Is.).

Material examined. 1 female; Kusaie: Malem; Dec. 16, 1937.
Dimensions (in mm).

Breadth of carapace	13
Length of carapace	8
Fronto-orbital length	5.5

Remarks. The carapace is convex anteriorly and the branchial regions are also more convex. The proportion of the length to breadth is 1:1.06. The fronto-orbital length is less than half the width of the carapace. The front is two-thirds the width of the carapace, the lobes having an oblique concave margin and well-defined external angle. The antero-lateral margin has four lobes excluding the external orbital angle. E-, N-, T- and S-lobes are divided into two teeth respectively. Furthermore, there is one small tooth below the external orbital angle. The antero-lateral teeth, therefore, are nine in number.

The areolets of the carapace are distinct, except P-region where it is not subdivided. 2 M is divided longitudinally in the anterior half.

The chelipeds are equal. The arm is furnished with a small acute tooth on the internal margin. The wrist and palm are rugulose on their upper and outer surfaces. The fingers are very stout and gapping between them. The tips of them are spoon-shaped.

9. *Xantho* (*Leptodius*) *crassimanus* A. Milne-Edwards

Plate XIII(II), fig. 8; text-fig. 6.

Xantho crassimanus A. Milne-Edwards 1867, p. 267.

Material examined. 1 male; Kusaie: Malem; Dec. 20, 1937. 1 male, 1 female; Isigaki-sima, Yaeyama-Group, Ryūkyū; Mar. 16, 1938; collected by Mr. T. Masaki.

Dimensions (in mm).

	(From Malem)	(From Isigaki-sima)	
	male	male	female
Breadth of carapace	23	33	28
Length of carapace	14.5	21	18
Fronto-orbital length	6.5	8.5	7.5
Breadth of front	5	6.5	5.5

Coloration. The dorsal face is of olive ochre colour. The fingers of the chelipeds are black. The ambulatory legs are mottled with grayish lavendar colour. The vental face is whitish.

Text-fig. 6.
Anterior male abdominal appendage of *Xantho* (*Leptodius*) *crassimanus*, ×40.

Description. The carapace is moderately convex in the anterior two-thirds, nearly flat in the posterior one-third, where also it is not areolated. The proportion of the length to breadth is 1:1.58. The fronto-orbital length is a little more than one-fourth the maximum breadth of the carapace. The upper surface is smooth and punctate. The front is a little projecting beyond the inner supra-orbital angle, from which it is separated by a notch; and divided into two lobes, of which the free edge may either be cut obliquely inwards, or be so excised as to give the front a four-pronged look. The antero-lateral margin is broader than the postero-lateral one and divided into five teeth, not including the outer orbital angle, or one tubercle below it.

The areolation of the carapace is prominent in the anterior two-

thirds. There is a deep groove between 1 M and 2 F. 1 M and 2 M are combined with each other. 2 M lobe is partially divided longitudinally in the anterior one-third. 3 M lobe is well marked off, but 4 M is not separated from 3 M. 2 L and 3 L are wholly separated by a deep broad furrow in the specimens from Isigaki-sima, but partially separated in the anterior half in the male from Malem. There is a shallow groove between 5 L and 6 L. 1 P is not marked off posteriorly. 1 R is separated from the fourth (S) tooth by a deep depression. There is a little prominent groove between 2 R and 3 R. 2 P lobes are fused with each other.

The chelipeds are unequal, right one being larger in all specimens. The upper and outer surfaces of the wrist and the upper surface of the palm are rugulose. The inner angle of the wrist is somewhat produced and forms a double-crowned tubercle. The outer surface of the palm is smooth, polished and punctate. The tips of the fingers are not hollowed, but pointed, touching each other. The ambulatory legs are not armed.

The abdomen of the male is five-jointed, third-fifth joints being fused.

Remarks. This species has never been reported from the Micronesia and Japanese territories.

10. *Xantho* (*Leptodius*) *sanguineus* (H. Milne-Edwards)

Plate XIV(III), fig. 5; text-fig. 7.

Chlorodius sanguineus H. Milne-Edwards 1834, p. 402—Mauritius.
Xantho exaratus var. *sanguinea* Ortmann 1893, p. 447—Ponape (Caroline Is.).
Xantho exaratus var. *sanguinea* Doflein 1904, p. 407—Jaluit (Marshall Is.).
Leptodius sanguineus Rathbun 1907, p. 37—Ponape (Caroline Is.).
Leptodius sanguineus Balss 1938, p. 42—Ralik Is.: Jaluit, Namrik (Marshall Is.). Aranuka, Nonuti (Gilbert Is.).

Material examined. 5 males; Kusaie: Malem; Dec. 16, 1937.

Dimensions (in mm).

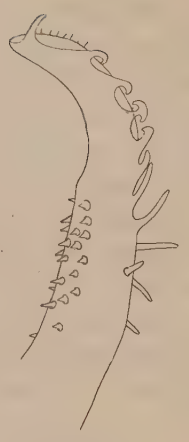
	(1)	(2)	(3)	(4)	(5)
Breadth of carapace	27	31	27	25.5	24
Length of carapace	16	19	16.5	15.5	15
Fronto-orbital length	8	9.5	8.5	9	8
Breadth of front	6.5	7.5	6.4	6.3	6

Remarks. This species closely resembles *Xantho* (*Leptodius*) *exaratus* (H. Milne-Edwards), from which it differs most conspicuously in the following characters.

1. The carapace is more convex in the anterior and antero-lateral parts.

2. The front is narrower; the proportion of the carapacial breadth to the breadth of front is 4:1.

3. The antero-lateral border bears a fifth tooth beneath the fourth (S) tooth. There is moreover one tooth below the external orbital angle.



Text-fig. 7.
Anterior male abdominal appendage of *Xantho* (*Leptodius*) *sanguineus*, ×60.

11. *Xanthias lamarckii* (H. Milne-Edwards)

Plate XIV(III), fig. 1.

Xantho Lamarckii H. Milne-Edwards 1834, p. 391—Mauritius.
Xanthias lamarcki Balss 1938, p. 50—Ralik Is.: Jaluit; Ratak Is.: Likieb, Medjeru (Marshall Is.). Apaiang, Aranuka, Apamama, Beru (Gilbert Is.).

Material examined. 1 female; Kusaie: Malem; Dec. 16, 1937.

Dimensions (in mm).

Breadth of carapace	11.5
Length of carapace	7
Fronto-orbital length	4
Breadth of front	3

Remarks. The carapace is strongly convex in the logitudinal direction. The upper surface is covered with fine granules in the anterior part of the carapace. The rest of the carapace is punctate. The proportion of the length to breadth is 1:1.64. The fronto-orbital length is a little more than one-third the maximum breadth of the carapace. The frontal margin is deflexed and divided into two rounded lobes; the median notch is distinct and V-shaped. The antero-lateral margin is armed with four teeth excluding the external orbital angle.

The areolets of the carapace are distinct in the anterior half. There is a deep groove between 1 M and 2 F. 1 M is combined with 2 M and there is no groove between them. 3 M is separated from the other lobes by deep grooves. 1 L, 2 L and 3 L are fused into one lobe. 4 L, 5 L and 6 L are separated from each other by shallow grooves, but the delineating grooves between these three lobes and R-regions are not distinct. R- and P-lobes are neither subdivided nor separated from each other.

The chelipeds are equal in the female. The arm is short and furnished with two crest-like teeth on the orbital portion of the upper border. The lower border of the arm is prolonged at its distal end into a rather acute spine. The wrist is provided with two small teeth on the inner angle. The palm is furnished with some granular ridges on the outer surface. The fingers are armed with small teeth and are in contact throughout their length. Their tips are pointed and crossing. The upper and outer surfaces of the chelipeds are ornamented with granules.

The four pairs of the ambulatory legs are compressed, granulose and similar to each other, but slightly decreasing in length from first to fourth. The dactylus is relatively longer, being as long as propodus in length.

12. *Etisus laevimanus* Randall

Plate XIII(II), fig. 7.

Etisus laevimanus Ortmann 1893, p. 473—Palau Is.
Etisus laevimanus Sakai 1936, p. 164—Palau Is.
Etisus laevimanus Balss 1938, p. 44—Aranuka, Tapeteuea (Gilbert Is.).

Material examined. 1 female; Palau Is.: Goréor I.: Feb. 2, 1938.
Dimensions (in mm).

Breadth of carapace	21
Length of carapace	14.5
Fronto-orbital length	9
Breadth of front	6

Remarks. The carapace is convex in both directions, smooth, and polished on the upper surface. The breadth of the carapace is nearly two-thirds the breadth of the carapace. The breadth of the front is just two-sevenths the maximum breadth of the carapace. The front is divided into two lobes and separated from the inner supra-orbital lobe by a deep notch. The frontal lobes are combined with each other; its anterior margins are almost straight in our specimen. The antero-lateral margin is cut into four teeth excluding the external orbital angle, the last two of which are claw-like.

The areolation of the carapace is well defined in the anterior part. 2 F-lobe is not distinct. 1 M is separated from 2 M by a little depression. 2 M is partially divided in the anterior half. 3 M is well marked off. There is a shallow groove between 3 M and 4 M. 1 L, 2 L, 3 L, 4 L are distinctly defined. The cervical groove is very deep. 1 R and

2 R are combined with each other. 2 R and 3 R are separated by a shallow groove by which 5 L and 6 L are divided. The rest of the regional lobes, namely 3 R, 1 P, 2 P are not subdivided.

The chelipeds are unequal, the right one being larger. The surface is smooth, glossy and punctate. The merus is trigonal and swollen on the upper border near the proximal joint. The wrist is armed with a stout tooth on the inner margin. The palm is not armed and compressed. The fingers are rather stout, denticulate on the inner margin and are hollowed at the tips. There is a gap between them.

The ambulatory legs are fringed with long hairs. The dactylus is granulated on the anterior margin and furnished with an acuminate spine at the base of the claw of the posterior margin.

13. *Actaea tomentosa* (H. Milne-Edwards)

Plate XIII(II), fig. 6; text-fig. 8.

Zozymus tomentosus H. Milne-Edwards 1834, p. 385; 1844, Pl. 11, figs. 2 a–b—Indian Ocean.

Actaea tomentosa Rathbun 1907, p. 42—Ponape (Caroline Is.).

Actaea tomentosa Odhner 1925, p. 70—Palau Is.: aNgeaur I.; Truk, Ponape (Caroline Is.). Ralik Is.: Namo, Ebon, Jaluit (Marshall Is.).

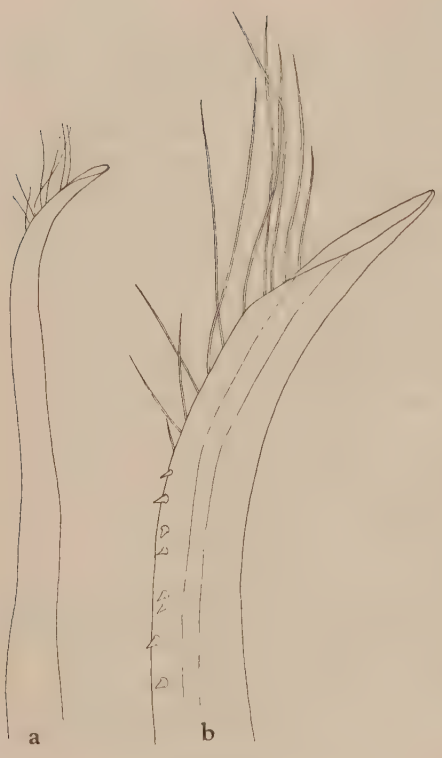
Material examined. 1 male, 1 female; Kusaie: Malem; Dec. 20, 1937.

Dimensions (in mm).

	male	female
Length of carapace	7.5	17.3
Breadth of carapace	11.5	27.5
Fronto-orbital length	4	8.5
Breadth of front	2.8	5.5

Coloration. The dorsal face of the body is of purplish-brown colour. The eyes are carmine red. The ventral face is whitish.

Description. The carapace is convex in the anterior and antero-lateral portions. The proportion of the length to breadth is 1:1.53 in the male or 1:1.59 in the female. The fronto-orbital length is a little more than one-third the maximum breadth of the carapace, but a little less than one-third in the female. The upper surface is furnished with closely-set granules and setae. The front is deflexed downwards and separated from the inner supra-orbital lobe by a broad notch. The frontal margin is bilobed; the median sinus is a broad V-shaped. The antero-lateral borders are convex and cut into four lobes, excluding outer orbital lobe. The postero-lateral margins are convergent abruptly



Text-fig. 8.
Anterior male abdominal appendage of *Actaea tomentosa*. a. ×10. b. ×60.

beneath the last antero-lateral lobe and form concaved surfaces dorsally where the merus segment of the last pair of the ambulatory legs is lodged.

The areolation of the carapace is well defined; subregional grooves are deep and smooth. 2 M is wholly divided into two lobes longitudinally. 1 R and 2 R are fused into one lobe. 2 P is not subdivided. The rest of the regional lobes are all well defined.

The chelipeds are slightly unequal, the left one being larger in both sexes. The upper and outer surfaces of the wrist, palm and fingers are furnished with the same kind of granules and setae as in the carapace. The wrist and palm are not armed. The fingers are short, stout and denticulate on the inner margins. Their tips are hollowed and spoon-shaped. There is no gap between them.

The ambulatory legs are short, robust and compressed; but dactyli are rather long and slender. The anterior borders of the ambulatory legs bear crest-like margins and are fringed thickly with long hairs.

The abdomen of the male is five-jointed, third-fifth joints being fused.

14. *Ozius rugulosus* Stimpson

Plate XIV(III), fig. 2.

Ozius rugulosus Stimpson 1907, p. 60, Pl. 7, fig. 6—Port Lloyd, Bonin Islands.

Material examined. 1 female; Kusaie: Malem; Dec. 16, 1937.

Dimensions (in mm).

Breadth of carapace	39

Length of carapace	25
Fronto-orbital length	11.5

Coloration. The dorsal surface of the body is of taupe brown colour. The ventral surface of isabella or ecru colour. The fingers of the chelipeds are black. The tips of the dactyli of the ambulatory legs are of dark apricot orange colour.

Description. The carapace is strongly convex from the front to back and nearly straight transversely. The proportion of the length to the breadth is 1:1.6. The fronto-orbital length is rather narrow, equaling one-third the maximum breadth of the carapace. The frontal margin is divided into four strongly-rounded teeth. The antero-lateral margin is armed with five teeth excluding the external orbital angle. The three anterior teeth are broad and blunt, but the posterior two are very small and acute; the fourth is broader than the following tooth and is more raised; the fifth is the smallest of the series. Behind this the posterior margins are convergent abruptly, representing concave curves. The gastric region is well defined and 1 M and 2 M are combined with each other. The branchial regions are cut into two lobes by two ridges, which run respectively from N- and T-teeth, obliquely upwards and inwards to the gastric region. The lobes of the rest of the carapace are not defined. The subhepatic and subbranchial regions of the carapace are furnished with granules. The orbital margin is subcircular and well marked off from the carapace.

Only one notch, where the flagellum of the antenna projects, is divided into the upper and the lower margins. The inner edge of the lower margin is rather projecting, so that a little impressed line can be seen between this angle and the lower margin.

The surface of the outer maxilliped is tomentose. The ischium is subrectangular with inner margins rounded basally, and the outer surface is channelled longitudinally. The merus is subpentagonal and its outer surface is ornamented with two longitudinal channels. The three-pointed palp is subcylindrical.

The chelipeds are unequal, the right one being larger. The upper and outer surface of the right are rugulose and ornamented with reticulate-granular ridges. The fingers are stout and gaping. The movable finger of the right cheliped is armed with a large tooth on the proximal end of the inner margin; the immovable finger with four obtuse teeth. The left cheliped is rugulose and tomentose on the outer and upper surfaces. Fingers of the left cheliped are armed with small

teeth and in contact throughout their length.

The four pairs of the ambulatory legs are compressed, granulose and similar to each other, but slightly decreasing in length from first to fourth.

Remarks. New to the fauna of Micronesia.

15. *Pseudozius caystrus* (Adams et White)

Plate XIII(II), fig. 5; text-fig. 9.

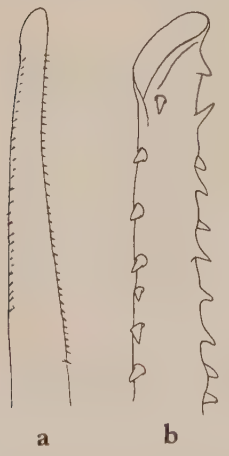
Panopeus caystrus Adams et White 1848, p. 42, Pl. 9, fig. 2—Eastern Seas.
Pseudozius caystrus Balss 1938, p. 64—Ralik Is.: Kwadjelin, Jaluit (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

Material examined. 5 males, 3 females; Kusaie: Malem; Dec. 16, 1937.

Dimensions (in mm).

	males (1–5)					female (6–8)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Breadth of carapace	19.5	18.4	17	16.2	11.5	18	15.5	14.5
Length of carapace	11.5	11.3	10	9.7	7.0	10.5	9.2	9.0
Fronto-orbital length	6.4	6.2	5.7	5.6	4.2	6.0	5.5	5.4

Coloration. The dorsal surface is of sudan brown colour. The ventral surface is ivory buff. The fingers of chelipeds are black.



Text-fig. 9.
Anterior male abdominal appendage of *Pseudozius caystrus*.
a. ×33. b. ×80.

Remarks. The carapace is transversely elliptical in shape. The proportion of the length to the breadth is 1:1.7. The upper surface is smooth, punctate and perfectly flat except the deflected anterior margin where it is somewhat rugulose. The fronto-orbital margin is narrow, almost equaling one-third the maximum breadth of the carapace. Its outer margin is straight not projecting, and the inner margin slightly undulated. There is a distinct transverse groove between these two margins. The eye is small, with the short eye-stalk which is concealed in the circular orbits. There is only one notch where the flagellum of the antenna projects.

The four obsolete lobes of the antero-lateral margin are slightly decreasing in its breadth from first to fourth.

The chelipeds are smooth and unequal in both sexes, right one being larger. The merus is trigonal, with inner surface flattened and in close contact with the side of the carapace; the wrist is armed with two small blunt teeth at its inner angle; the palm is four-fifths as long as the width of the carapace. The movable finger of the larger cheliped bears a large blunt tooth on the proximal end of the inner margin; the fingers are stout and gaping. The fingers of small cheliped are in contact and crossing each other at their tips.

The ambulatory legs are smooth and hairy beneath. The dactyli are thickly pubescent.

The abdomen of the male is seven-jointed; its surface is smooth.

GONEPLACIDAE

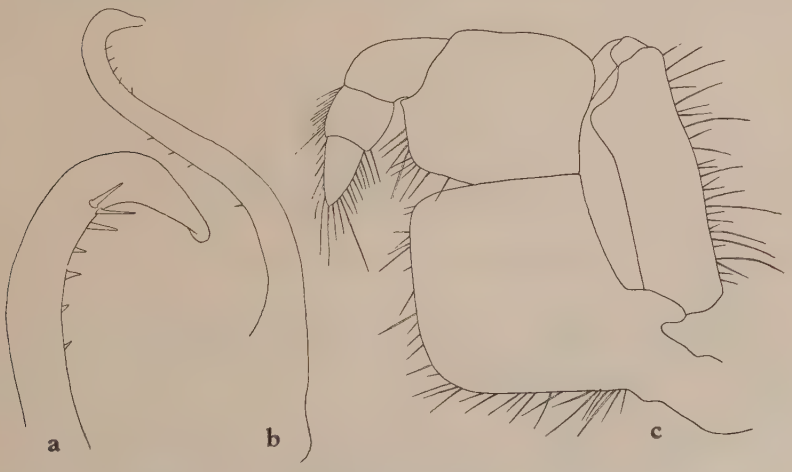
16. *Heteropilumnus setosus* (A. Milne-Edwards)

Plate XIII(II), fig. 4; text-fig. 10.

Heteropilumnus setosus Balss 1938, p. 70—Ralik Is.: Kwadjelin, Jaluit; Ratak Is.: Medjeru (Marshall Is.).

Material examined. 1 male, 1 female; Kusaie: Malem; Dec. 21, 1937.

Dimensions (in mm).



Text-fig. 12. *Heteropilumnus setosus* (A. M.-Edw.)

a. anterior male abdominal appendage, ×60. b. the same, ×25. c. third maxilliped, ×25.

	male	female
Fronto-orbital length	3.8	3
Maximum breadth of carapace	5.3	4
Length of carapace	3.5	2.7

Remarks. The carapace is quadrilateral and the antero-lateral angle is rounded. The greatest breadth of the carapace is nearly 1.5 times its length. The outer surface of the carapace is covered anteriorly and laterally with short hairs. The fronto-orbital breadth is slightly longer than the length of the carapace. The outer orbital angle is not prominent, being confluent with the antero-lateral border. The antero-lateral margin is slightly undulating and armed with two spines or teeth.

The third maxilliped is broad; the merus is much shorter than the ischium. The inner margin of the exognath presents a very distinct prominence near its distal end, as in all species of the genus *Lithocheira*.

The chelipeds are unequal, left one bing larger in the male, but missing in the female. The arm is furnished with a blunt tooth near the distal end of the anterior margin. The wrist is provided with a blunt tooth on the inner angle. The larger (left) palm of the male is smooth, but the smaller palm is furnished with granules. The outer surface of the palm is covered with long hairs. The immovable finger is short and high; the movable finger is much longer. The ambulatory legs are all unarmed but densely fringed with long hairs along the margins.

The abdomen is seven-jointed.

GECARCINIDAE

17. *Cardisoma carnifex* (Herbst)

Plate XV(IV), fig. 2.

Cardisoma carnifex Balss 1938, p. 80—Aranuka (Gilbert Is.).

Material examined.

Cardisoma carnifex: 1 male; Ponape: Laṅar (Langar) I.; Jan. 6, 1938. 1 male; Iriomote-sima: Sonai (Ryūkyū); Feb. 18, 1937, collected by Mr. U. Sōma.

Cardisoma hirtipes: 1 male; Miyako-sima: Hisamatu (Ryūkyū); Feb. 13, 1937. 1 female; Isigaki-sima: Maézato (Ryūkyū); Sep. 18, 1937; collected Mr. Manabu Masaki. 1 male; Iriomote-sima: Komi; Feb. 19, 1937.

Remarks. This species is one of the well known land crabs. It occurs in the whole Indo-Pacific region side by side with *Cardisoma hirtipes* DANA. These two species are easily distinguished by following characters.

Cardisoma carnifex (HERBST)

1. The antero-lateral margin is provided with an epibranchial tooth immediately behind the outer orbital angle.
2. The breadth of the orbit is greater than the anterior breadth of the front.
3. The lateral margins of the carapace are strongly and abruptly bulging behind the epibranchial teeth.
4. The granulated line which marks the antero-lateral border of the carapace is prolonged far behind the level of the gastro-cardiac suture.
5. The posto-frontal lobes and regions of the carapace are indistinct.
6. The hairy part of the pterygostomial regions is as broad as the base of the buccal cavern.
7. The infra-orbital border is passing rectangularly into the lateral one.
8. The merus of ambulatory legs is fringed with few hairs only at the posterior margin.

Cardisoma hirtipes DANA

1. The antero-lateral margin is provided with an epibranchial tooth at a longer distance behind the outer orbital angle.
2. The breadth of the orbit is about three-fourths of the anterior breadth of the front.
3. The lateral margins of the carapace are less bulging behind the epibranchial teeth.
4. The granulated line is not prolonged behind the suture.
5. The posto-frontal lobes and regions of the carapace are much more ditsinct.
6. The hairy part of the pterygostomial regions is much broader than the base of the buccal cavern.
7. The infra-orbital border is passing with an acute angle into the lateral one.

8. The merus of the ambulatory legs is bordered with bristles at the hind margin.

OCYPODIDAE

18. *Uca annulipes* (Latreille)

Plate XVI(V), fig. 2.

Uca annulipes Sakai 1936, p. 170—Palau Is.
Uca annulipes Miyake 1938, p. 109—Saipan (Mariana Is.). Palau Is.: Babldaob I.; Yap (Caroline Is.).

Material examined. 2 males, 4 females; Ponape: Kiti; Jan. 15, 1938. 2 males; Kusaie: Malem; Dec. 16, 1937. 1 male, 1 female; Babldaob I.: Marukyoku (Palau Is.); Feb. 4, 1938.

19. *Uca marionis nitida* (Dana)

Plate XVI(V), fig. 1.

Uca marionis nitidus Sakai 1936, p. 70—Palau Is.

Material examined. 5 males, 2 females; Kusaie: Malem; Dec. 16, 1937.

GRAPSIDAE

20. *Grapsus grapsus* (Linnaeus)

Plate XVII(VI), fig. 1.

Grapsus grapsus Ortmann 1894, p. 703—Palau Is.
——— Doflein 1904, p. 406—Jaluit (Marshall Is.).
——— Balss 1938, p. 77—Ralik Is.: Kwadjelin, Jaluit (Marshall Is.). Aranuka, Tapeteuea (Gilbert Is.).

Material examined. 1 female; Kusaie: Lelo; Dec. 16, 1937.

21. *Pachygrapsus plicatus* (H. Milne-Edwards)

Plate XVII(VI), fig. 3.

Grapsus plicatus H. Milne-Edwards 1837, p. 89—Sandwich Is.
Pachygrapsus plicatus Doflein 1904, p. 406—Jaluit (Marshall Is.).
Pachygrapsus plicatus Rathbun 1907, p. 29—Kusaie (Caroline Is.).
Pachygrapsus plicatus Balss 1938, p. 78—Ralik Is.: Kwadjelin, Jaluit, Namrik; Ratak Is.: Likieb (Marshall Is.). Makin Aranuka, Apamama, Tapeteuea, Beru, Tamana (Gilbert Is.).

Material examined. 2 males, 1 female; Kusaie: Malem; Dec. 16, 1937.

22. *Metopograpsus oceanicus* (Jaquinot et Lucas)

Plate XVII(VI), fig. 4.

Metopograpsus oceanicus Sakai 1936, p. 173, Pl. 14, fig. 3—Palau Is.
——— Sakai 1936, p. 172—Palau Is.

Material examined. 1 male; Ponape: Nat.; Jan. 6, 1938.

23. *Percnon planissimum* (Herbst)

Plate XVII(VI), fig. 2.

Leiolophus planissimus Doflein 1904, p. 407—Jaluit (Marshal Is.).
Percnon planissimum Balss 1922, p. 156—Jaluit. Gilbert Is.
Percnon planissimum Balss 1938, p. 80—Ralik Is.: Ailinglablab, Jaluit; Ratak Is.: Likieb, Medjeru (Marshall Is.). Makin, Aranuka, Apamama, Beru, Nukunau (Gilbert Is.).

Material examined. 1 juv.; Kusaie; Dec. 20, 1937. 5 juv. Kusaie: Malem; Dec. 21, 1937.

24. *Helice leachii* Hess

Plate XVI(V), fig. 3.

Helice leachii Hess 1865, p. 153—Sydney.
Helice leachi Rathbun 1907, p. 36—Kusaie (Caroline Is.); Ôsima (Prov. Izu).
Helice leachi Parisi 1918, p. 108, Pl. 8, fig. 2—Titi-zima (Bonin Is.).

Material examined. 1 male; Kusaie: Malem; Dec. 16, 1937. 4 male, 1 females; Iriomote-sima: Komi (Ryūkyū); Feb. 19, 1937. 1 male, Isigaki-sima: Kabira (Ryūkyū); Feb. 25, 1937; collected by S. Miyake.

Habitat. Mangrove swamps.

Coloration. The dorsal surface is of light slate olive colour. The upper and outer surfaces of the merus and wrist are of dark slate purple colour. The ventral face of the body is of light pinkish cinnamon colour. The dorsal surface of the ambulatory legs are mottled with these named colours.

Dimensions (in mm).

	male (Kusaie)
Distance between external orbital angles	13.0
Distance between first epibranchial teeth	14.5
Distance between second epibranchial teeth	14.4
Minimum breadth of carapace beneath the second epibranchial teeth	14.0
Breadth of carapace at hind part (above the base of penultimate pair of legs)	14.4
Breadth of posterior margin of carapace	8.0
Length of carapace in the median line	12.5

Remarks. The carapace is strongly curved in the longitudinal direction and the metabranchial region is very much sloping downward. The upper surface of the carapace is smooth and punctate. The lateral margins of the carapace are slightly narrowed anteriorly and the maximum breadth is found between the anterior epibranchial teeth, further distally the lateral margins are distinctly concave, bulging out again above the bases of the penultimate pair of the legs. The external orbital angles are acute, directed forward; the distance between them is distinctly greater than the length of the carapace. The lateral marigns are cut into two epibranchial teeth, excluding the exterior orbital angle. The anterior (first) epibranchial tooth is separated from the lateral margins by a deep and wide incision; it is somewhat projecting forward, ending at the tip of a tooth. The second epibranchial tooth is a little projecting forward. The proportion of the length of the carapace to the maximum breadth of the carapace is 1 : 1.16. The breadth of the front is much less than the breadth of the posterior margin of the carapace. The front is vertically deflexed and frontal margin is convex.

The stridulating ridge on the subhepatic region is characterized in the genus *Helice*. In the male, tubercles on the ridge number about fifteen and in the female thirteen. They begin under the base of the outer orbital angle. In the male, one tubercle under the inner end of the cornea is largest of the series, but in the female the corresponding one is not larger than the rest.

The chelipeds are almost equal in the male from Malem, but unequal in the male from Isigaki-sima. The arm is trigonal; the inner and outer edges of the lower margin are furnished with granules. The inner margin of the wrist is ornamented with granules and the inner angle is armed with few acuminate teeth. The palm is longitudinally carinate on the proximal part of the outer margin. The fingers are short, denticulate on the inner margins and pointed at the tips. The male is ornamented with a tuft of short hairs filling up the gap between the fingers.

The ambulatory legs are rather slender; the penultimate pair is the largest of all. The merus is three times as long as broad, its anterior border bears a rectangular tooth at its subdistal end. The upper margins of the carpus and propodus are furnished with closely-set setae.

The abdomen of the male is seven-jointed. The last segment is

longer than broad. The proportion of the length of the last segment to the sixth segment is 1:1.2. The proportion of the maximum breadth of the last segment to the penultimate one is 1:2.

25. *Sesarma (Parasesarma) moluccensis* de Man

Plate XVI(V), fig. 4.

Sesarma (Parasesarma) moluccensis Miyake 1938, p. 109—Saipan (Mariana Is.).

Material examined. 3 males; Kusaie: Malem; Dec. 16, 1937. 1 female; Kusaie: Malem; Dec. 20, 1937. 1 male, 1 ovig. female; Ponape: Matalanim (Nanue); Jan. 10, 1938.

DROMIIDAE

26. *Cryptodromia canaliculata* Stimpson

Plate XIII(II), fig. 3.

Cryptodromia canaliculata Stimpson 1907, p. 176—Gaspar Strait; Okinawa-Honto? (Loo Choo); Kikai-sima.

Cryptodromia canaliculata Balss 1938, p. 5—Jaluit (Marshall Is.). Taritari, Apaiang, Aranuka, Apamama, Nonuti, Tamana (Gilbert Is.).

Material examined. 1 male; Kusaie: Malem; Dec. 16, 1937.

Remarks. The back was covered by a sponge. Our specimen agrees with Stimpson's description of the typical form. This species is easily distinguished from the other members of the genus of Japanese waters by the shape of the abdomen, in that the male has a deep sinus on each side at the sixth segment.

MAJIDAE

27. *Xenocarcinus esakii*, sp. nov.

Plate XIII(II), fig. 1; text-fig. 11.

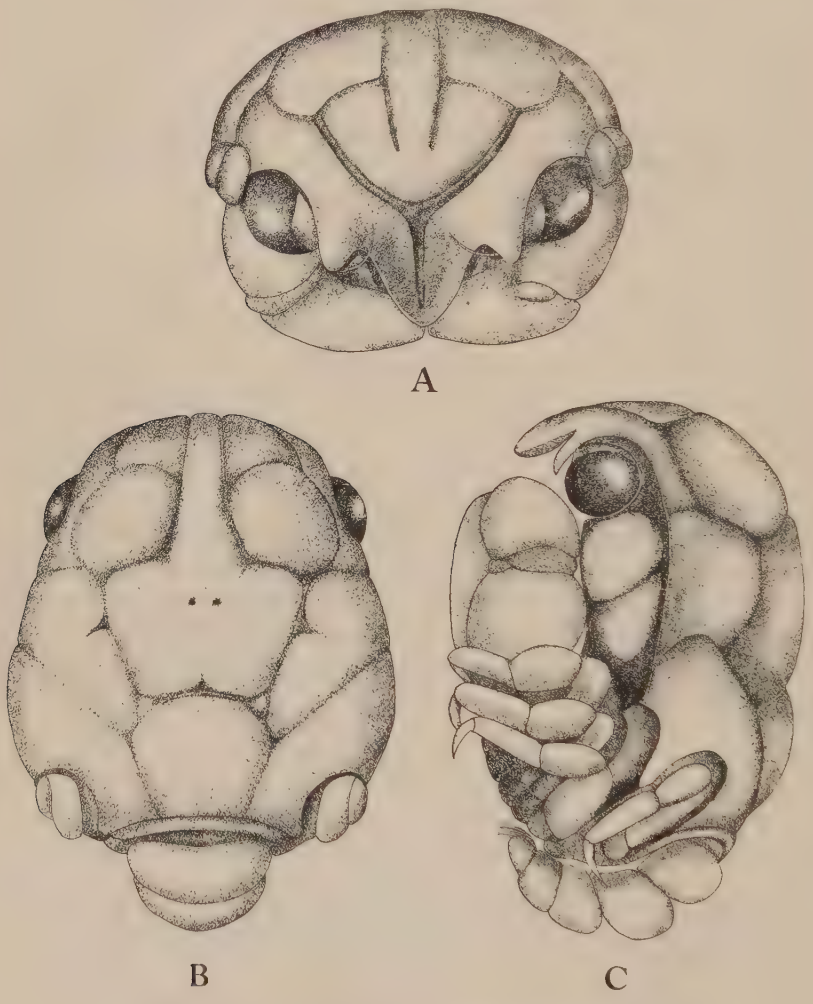
Holotype. Female; Kusaie: Malem (Caroline Is.); Dec. 22, 1937; in the Zoological Laboratory, Kyūsyū Imperial University.

Dimensions (in mm).

Length of carapace	7.3
Breadth of carapace	6.5

Description. The carapace is oval and its dorsal surface is smooth, glossy and strongly convex in both directions. The regions of the upper surface are well defined and delineating furrows are deep and well marked. The protogastric regions are divided into two lobes by

a transverse groove, of which the anterior lobe is narrower than the posterior one. The meso- and posto-gastric lobes are fused into one lobe. There are two punctate hollows situated transversely at the



Text-fig. 11. *Xenocarcinus esakii*, sp. nov. ×9.
A. frontal aspect. B. dorsal aspect. C. lateral aspect.

centre of this region. The branchial region is subdivided into two lobes. The epibranchial lobe is very small; the meso-branchial lobes are with a notch at the middle of the inner margin; the posto-branchial

lobe is furnished with rather deep furrow on the dorsal face, where the last ambulatory leg lodges. The hepatic regions are on the lateral side and divided into two lobes.

The rostrum is short, single-lobed and deflexed vertically, separated from the supra-ocular lobe by a deep sinus. The supra-ocular lobe is prolonged in an acuminate tooth and curved downwards. The posto-ocular edge is short; the infra-ocular edge is not distinct. The eye-stalk is short; the eye is lodged in a cavity between the supra-ocular lobe and the wrist of the cheliped. The basal segment of the antenna projects from the hiatus of the orbit.

The chelipeds are unequal, the right one being larger. The arm is very short and a little longer than the wrist. It is trigonal and furnished with a tubercle on the upper margin of subdistal end and two small tubercles on the lower margin of the distal end. The wrist is robust and somewhat compressed. The palm is strongly compressed, short and broadened basally. The fingers are short, stout, denticulate on inner margin and crossed at the tips. There are no gap between fingers.

The ambulatory legs are slender and without armature. The last pair of the legs are on the dorsal face. The dactylus is very long; its tip is pointed into a single claw.

The abdomen of the female is seven-jointed.

Remarks. The species is allied to *X. truncatifrons* Balss, but it is easily distinguished by the front and the areolation of the carapace.

28. *Parazewa palauensis*, sp. nov.

Text-figs. 12–13.

Holotype. Male; Babldáob I.: Ngarsmau, 2 metres deep; Feb. 21, 1938.

Dimensions (in mm).

Length of carapace, excluding rostrum	5.6
Breadth of carapace, excluding branchial spine	4.0

Description. The carapace is subpyriform. The proportion of the length of the carapace to the distance between the external angles of the orbits is as 1.9 to 1. The proportion of the length of the carapace to breadth is as 1.4 to 1. The rostrum is strongly deflexed downwards, the rostral spines are well divergent. The supra-orbital eave is not dilated. The praeorbital spine is long, laminate and directed obliquely

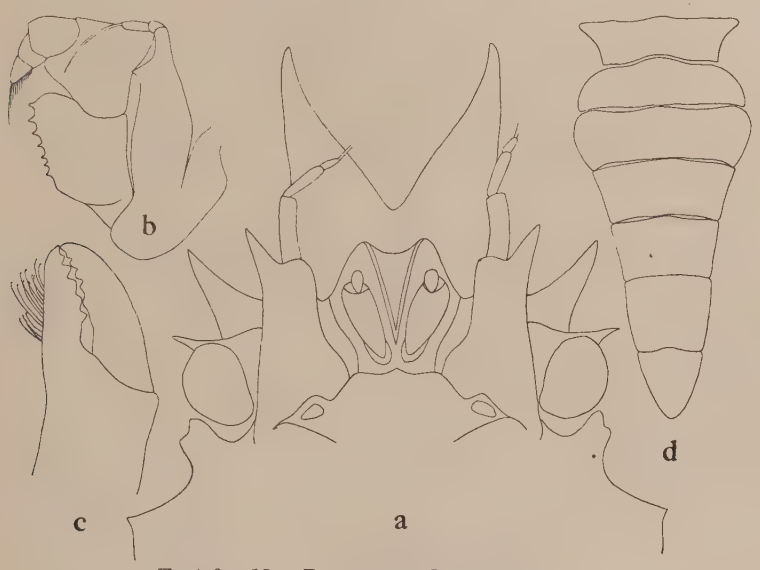
forwards. There is no intercalated spine. The posto-ocular spine is not dilated and divided into two knobs at the tips. The eye-stalk is short and armed with a small, acute spine on the anterior border near the cornea.

Text-fig. 12. *Parazewa palauensis*, sp. nov. × 12.

The gastric and the cardiac regions are elevated. The epibranchial lobes, which are situated on each side of the cervical suture, are provided with a large dentiform tubercle. There are ten spines in the gastric region, of which two spines are in the median line. The cardiac region rises into two small blunt tubercles transversely. The intestinal region is armed with two large tubercles transversely, directed obliquely backwards. The branchial region is armed with two long, stout teeth, of which one projects on the lateral margin.

The basal segment of the antenna is elongated and broadened

basally, and armed with an acuminate spine at the antero-lateral angle which is visible from above. The third maxilliped has the ischium denticulated on the inner margin; the extero-lateral border of the merus is concave; its antero-lateral angle is little produced. The exognath is furnishd with an acute tooth on the inner margin near the distal end.



Text-fig. 13. *Parazewa palauensis*, sp. nov.

a. front of carapace and orbit, in ventral aspect. ×16.7.
b. third maxilliped. ×16.7. c. fingers of cheliped. ×16.7.
d. abdomen. ×14.

The chelipeds are almost equal and not so stout. The arm and the wrist are furnished with crest-like teeth irregularly on the upper borders. The fingers are denticulated on the inner margin. The immovable finger is fringed with long hairs on the lower surface.

The ambulatory legs are rather stout and have carinate teeth irregularly as in the arm and the wrist of chelipeds. The dactylus is hooked at the tips.

The abdomen of the male is seven-jointed.

Remarks. It has some resemblance to *Parazewa bocki* Balss in the general appearance, but it is easily distinguished by the supra-ocular eave. In our specimen it is not so dilated and the eye-stalk is rather short. Tubercles on the carapace are more numerous in our specimen.

Part II.

A Check List of Micronesia Brachyura

Order **DECAPODA**

Suborder **REPTANTIA**

Tribe ***Brachyura***

Subtribe ***Dromiacea*** DE HAAN 1839

Superfamily **Dromiidea** ALCOCK 1899

Family **Dromiidae** ALCOCK 1899

1. *Cryptodromia canaliculata* STIMPSON

Cryptodromia canaliculata BALSS 1938, p. 5—Jaluit (Marshall Is.). Taritari, Apaiang, Aranuka, Apamama, Nonuti, Tamana (Gilbert Is.).

Material examined. 1 male; Kusaie (Caroline Is.); Dec. 16, 1937 (Collected by Prof. TEISO ESAKI).

2. *Cryptodromia hilgendorfi* DE MAN

Cryptodromia hilgendorfi BALSS 1938, p. 5—Nonuti (Gilbert Is.).

Family **Dynomenidae** ORTMANN 1892

3. *Dynomene hispida* DESMAREST

Dynomene hispida BALSS 1938, p. 7—Aranuka, Apamama (Gilbert Is.).

4. *Dymomene praedator* A. MILNE-EDWARDS

Dynomene praedator BALSS 1938, p. 7—Medjeru (Marshall Is.). Aranuka (Gilbert Is.).

5. *Dynomene spinosa* RATHBUN

Dynomene spinosa BALSS 1938, p. 7—Palau Is. Jaluit (Marshall Is.).

Subtribe ***Oxystomata*** DE HAAN 1841

Family **Calappidae** ALCOCK 1896

6. *Calappa hepatica* (LINNAEUS)

Calappa hepatica ORTMANN 1892, p. 568—Palau Is.
——— RATHBUN 1907, p. 67—Taritari (Gilbert Is.).
——— PARISI 1914, p. 8—Truk (Caroline Is.).

——— Horii 1916, p. 250—Jaluit (Marshall Is.).
——— Sakai 1936, p. 157—Palau Is.
——— Balss 1938, p. 8—Jaluit (Marshall Is.). Taritari, Aranuka, Apamama (Gilbert Is.).

Material examined. 1 male; Songél a Lise: B-division, flat reef; May 5, 1938 (collected by Mr. Shiro Murakami).

7. *Calappa philarguius* (Linnaeus)

Calappa philargius Parisi 1914, p. 8—Truk (Caroline Is.).

8. *Matuta banksii* Leach

Matuta banksii Ortmann 1892, p. 573—Palau Is.

Family **Leucosiidae** Dana 1852

9. *Actaeomorpha erosa* Miers

Actaeomorpha erosa Balss 1938, p. 8—Aranuka, Apamama (Gilbert Is.).

10. *Cryptocnemus aberrans* Balss

Cryptocnemus aberrans Balss 1938, p. 10, Pl. 1, fig. 3—Talagi, British Salomon Is. (Type-locality).

Material examined. 2 males; Goréor I.: Madalâi, flat reef; May 20, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

11. *Ebaliopsis erosa* (A. Milne-Edwards)

Ebaliopsis erosa Balss 1938, p. 10—Aranuka, Apamama (Gilbert Is.).

12. *Leucosia perlata* de Haan

Leucosia perlata Sakai 1936, p. 157, text-figs. 1, 2 a—Palau Is.

13. *Leucosides whitmeei* (Miers)

Leucosides whitmeei Rathbun 1907, p. 68—Mela [=Wela?, Truk] (Caroline Is.).

14. *Nucia gelida* Rathbun

Nucia gelida Rathbun 1907, p. 68, Pl. 5, fig. 4; Pl. 9, figs. 2, 2 a–c—Fakarava I., Paumotu Is. (Type-locality).

Material examined. 1 male; Songél a Lise: H-division; Mar. 2, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

15. *Nucia speciosa* Dana

Nucia speciosa Balss 1938, p. 9—Apamama (Gilbert Is.).

16. *Oreophorus rugosus* Stimpson

Oreophorus rugosus Balss 1938, p. 9—Taritari, Aranuka, Apamama, Nukunau (Gilbert Is.).

Material examined.

2 males; Goréor I.: S.W. Madalâi, flat reef; May 11, 1938 (Murakami).

1 male, 1 female; Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

Subtribe ***Brachygnatha*** de Haan 1850

Superfamily **Oxyrhyncha** Latreille

Family **Majidae** Alcock 1895

17. *Camposcia retusa* Latreille

Camposcia retusa Balss 1938, p. 11—Ebon, Likieb (Marshall Is.).

Material examined. 1 male; Tokobei I.; Jan. 8, 1938 (Murakami).

18. *Oncinopus aranea* (de Haan)

Oncinopus aranea Balss 1938, p. 12—Apamama (Gilbert Is.).

19. *Achaeus* sp.

Achaeus sp. Balss 1938, p. 12, text-fig. 1—Aranuka (Gilbert Is.).

20. *Parazewa bocki* Balss

Parazewa bocki Balss 1938, p. 13, Pl. 1, fig. 1, text-fig. 2—Apaiang, Aranuka, Apamama (Gilbert Is.).

21. *Parazewa palauensis* Miyake

Described in Part I of this paper.

Material examined. 1 male; Babldáob I.: Ngaramau; Feb. 21, 1938 (Esaki).

22. *Pseudomicippe incerta* Balss

Pseudomicippe incerta Balss 1938, p. 15, Pl. 1, fig. 2—Jaluit (Marshall Is.).

23. *Menaethius monoceros* (Latreille)

Menaethius monoceros Balss 1938, p. 17—Aranuka, Apamama, Tamana, Arorai (Gilbert Is.). Jaluit, Likieb (Marshall Is.).

Menaethius monoceros Rathbun 1907, p. 64—Mela [= ?Wela, Truk] (Caroline Is.).

24. *Trigonothir obtusirostris* Miers

Trigonothir obtusirostris Balss 1938, p. 18, text-figs. 3–6—Aranuka, Apamama, Beru, Nukunau, Tamana. Arorai (Gilbert Is.).

25. *Trigonothir pyramidatus* (Heller)

Trigonothir pyramidatus Balss 1938, p. 20—Jaluit (Marshall Is.).

26. *Xenocarcinus depressus* Miers

Xenocarcinus depressus Sakai 1936, p. 160—Palau Is.

Material examined. 1 male, 1 female; Goréor I.; Feb. 28, 1938 (Murakami).

27. *Xenocarcinus esakii* Miyake

Described in Part I of this paper.

Material examined. 1 female; Kusaie (Caroline Is.); Dec. 22, 1937 (Esaki).

28. *Xenocarcinus truncatifrons* Balss

Xenocarcinus truncatifrons Balss 1938, p. 20, text-figs. 7–9—Aranuka (Gilbert Is.).

29. *Tylocarcinus styx* (Herbst)

Tylocarcinus styx Balss 1938, p. 22—Jaluit (Marshall Is.). Tapeteuea (Gilbert Is.).

30. *Tylocarcinus gracilis* Miers

Tylocarcinus gracilis Balss 1938, p. 22—Aranuka (Gilbert Is.).

31. *Perinea tumida* Dana

Perinea tumida Balss 1938, p. 22—Jaluit (Marshall Is.). Aranuka, Apamama, Arorai (Gilbert Is.).

32. *Hyastenus* sp.

Hyastenus sp. (aff. *Hyastenus biformis* Rathbun) Sakai 1936, p. 158, text-figs. 3 a–c—Palau Is.

33. *Hyastenus subinermis* Zehntner

Hyastenus subinermis Balss 1938, p. 23—Jaluit (Marshall Is.).

34. *Hyastenus uncifer* Calman

Hyastenus uncifer Calman 1909, p. 712, Pl. 72, figs. 8–9.

Material examined. 1 male; Goréor I.: Ngarekamâis; Jan. 28, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

35. *Cyclax (Cyclomaja) suborbicularis* Stimpson

Cyclax (Cyclomaja) suborbicularis Balss 1938, p. 23—Jaluit (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

36. *Schizophrys aspera* (H. Milne-Edwards)

Schizophrys aspera Balss 1938, p. 24—Jaluit (Marshall Is.). Apamama (Gilbert Is.).

37. *Micippa cristata* (Linnaeus)

Micippa cristata Ortmann 1893, p. 59—Palau Is.

37 a. *Micippa cristata granulipes* Zehntner

Micippa cristata granulipes Sakai 1936, p. 160—Palau Is.

38. *Micippa philyra* (Herbst)

Micippa philyra Balss 1938, p. 24—Ebon (Marshall Is.). Makin Taritari, Apaiang, Aranuka, Apamama, Nonuti, Nukunau, Tamana (Gilbert Is.). Nauru I.

Material examined.

1 male; Songél a Lise: A-division; Dec. 17, 1937 (Murakami).

1 female; Ngaiáges I.; Mar. 7, 1937 (Murakami).

39. *Tiarinia angusta* Dana

Tiarinia angusta Sakai 1936, p. 160, text-fig. 4—Palau Is.

Material examined.

1 male; Toágel Mid (Ngarmid passage); Jan. 29, 1938 (Murakami).

1 male; South of Ngaregól I.; Mar. 25, 1938 (Murakami).

1 male; Goréor I.: Ngarekamâis; Mar. 29, 1938 (Murakami).

40. *Tiarinia cornigera* (Latreille)

Tiarinia cornigera Dana 1852, p. 110, Pl. 3, figs. 5 a–e.
Tiarinia cornigera Stimpson 1907, p. 12, Pl. 3, fig. 1.

Material examined.

1 ovig. female; Peliliou I.; Ngarageúkl; Jan. 20, 1938 (Murakami).

1 male, 1 female; Tokobei I.; Apr. 8, 1938 (Murakami).

Family **Parthenopidae** Alcock 1895

41. *Parthenope* (*Rhinolambrus*) *pelagica* (Rüppell)

Lambrus pelagicus Rüppell 1830, p. 15, Pl. 4, fig. 1; Pl. 6, fig. 8—Red Sea.
Parthenope (*Parthenope*) *melana* Rathbun 1907, p. 66, Pl. 5, fig. 6; Pl. 6, fig. 2—Mela [=Wela, Truk] (Caroline Is.).

Material examined.

1 male; Goréor I.; Feb. 24, 1938 (Murakami).

1 male; Goréor I.: S.W. Madalâi, flat reef; May 20, 1938 (Murakami).

Subtribe ***Brachyrhyncha*** Borradaile 1907

Family **Atelecyclidae** Ortmann 1893

42. *Kraussia integra* (de Haan)

Kraussia integra Balss 1938, p. 29—Apamama (Gilbert Is.).

43. *Kraussia rastripes* Müller

Kraussia rastripes Balss 1938, p. 28, text-fig. 13—Palau Is., Ponape (Caroline Is.). Aranuka, Beru, Nukunau (Gilbert Is.).

Material examined. 1 male; aUgulpelú Reef; May 3, 1938 (Murakami).

44. *Kraussia rugulosa* (Krauss)

Kraussia rugulosa Balss 1938, p. 27, text-fig. 10—Jaluit (Marshall Is.). Aranuka, Apamama, Beru, Nukunau (Gilbert Is.).

Family **Portunidae** Miers 1886

45. *Catoptrus nitidus* A. Milne-Edwards

Catoptrus nitidus Balss 1938, p. 29—Jaluit (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

46. *Carupa tenuipes* Dana

Carupa tenuipes Balss 1938, p. 29—Jaluit (Marshall Is.).

47. *Neptunus* (*Achelous*) *granulatus* (H. Milne-Edwards)

Portunus (*Achelous*) *granulatus* Rathbun 1907, p. 60—Truk: Mela (=Wela I.?). Taritari (Butaritari).
Neptunus (*Achelous*) *granulatus* Parisi 1916, p. 172—Truk (Caroline Is.).

Neptunus (*Achelous*) *granulatus* Balss 1938, p. 31—Apaiang, Aranuka, Apamama, Tapeteuea (Gilbert Is.).

Material examined. 1 male; Babldáob I.: Melekéiok; Feb. 5, 1938 (Murakami).

48. *Neptunus* (*Hellenus*) *longispinosus* Dana

Neptunus (*Hellenus*) *longispinosus* Balss 1938, p. 31—Aranuka (Gilbert Is.).

49. *Neptunus alcocki* Nobili

Neptunus alcocki Balss 1938, p. 31—Aranuka (Gilbert Is.).

50. *Neptunus pelagicus* (Linnaeus)

Neptunus pelagicus Sakai 1936, p. 161—Palau Is.

51. *Thalamita admete* (Herbst)

Thalamita admete Rathbun 1907, p. 63—Mela [= ?Wela I., Truk] (Caroline Is.).
Thalamita admeto Horii 1916, p. 250—Jaluit (Marshall Is.).
Thalamita admeta Balss 1938, p. 34—Ailinglablab, Jaluit, Likieb, Medjeru (Marshall Is.). Aranuka, Apamama, Nonuti, Tapeteuea, Beru, Nukunau, Tamana (Gilbert Is.).

51 a. *Thalamita admete* var. *edwardsii* Borradaile

Thalamita admeta var. *edwardsii* Balss 1938, p. 34—Taritari, Nonuti (Gilbert Is.).

52. *Thalamita bouvieri* Nobili

Thalamita bouvieri Balss 1938, p. 34—Aranuka (Gilbert Is.).

53. *Thalamita coeruleipes* Jacquinot et Lucas

Thalamita coeruleipes Ortmann 1893, p. 85—Caroline Is.
Thalamita coeruleipes Balss 1938, p. 33—Aranuka, Beru (Gilbert Is.).

Material examined.

1 male, 1 ovig. female; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

1 female; Toágel Mid (Ngarmid passage); Jan. 29, 1938 (Murakami).

54. *Thalamita crenata* Latreille

Thalamita crenata Balss 1938, p. 32—Aranuka, Nonuti (Gilbert Is.).

Material examined. 3 males; Truk (Caroline Is.); Jan. 21, 1937 (Esaki).

55. *Thalamita danae* Stimpson

Thalamita danae Balss 1938, p. 33—Jaluit (Marshall Is.). Taritari, Apaiang, Aranuka (Gilbert Is.).

56. *Thalamita integra* Dana

Thalamita integra Parisi 1916, p. 177—Truk (Caroline Is.).
Thalamita integra Sakai 1936, p. 162—Palau Is.
Thalamita integra Balss 1938, p. 33—Aranuka (Gilbert Is.).

Material examined.

1 male, 1 female; Goréor I.; Feb. 2, 1938 (Esaki).

1 male; Songél a Lise: B-division, flat reef; Mar. 5, 1938 (Murakami).

57. *Thalamita picta* Stimpson

Thalamita picta Balss 1938, p. 33—Jaluit, Namrik, Likieb, Medjeru (Marshall Is.). Taritari, Aranuka, Tapeteuea, Nukunau, Tamana (Gilbert Is.).

58. *Thalamita prymna* (Herbst)

Thalamita prymna Parisi 1916, p. 176—Truk (Caroline Is.).

59. *Thalamita spinimana* Dana

Thalamita spinimana Sakai 1936, p. 162, Pl. 12, fig. 1—Palau Is.

Material examined. 3 females (1 ovig.); Goréor I.: Ngarekamâis; Jan. 28, 1938 (Murakami).

60. *Thalamita seurati* Nobili

Thalamita seuratis Balss 1938, p. 34, Pl. 2, fig. 6; text-fig. 14—Apamama, Tamana (Gilbert Is.).

61. *Thalamitoides quadridens* (A. Milne-Edwards)

Thalamitoides quadridens Rathbun 1907, p. 64—Jaluit (Marshall Is.).
Thalamitoides quadridens Balss 1938, p. 35—Tapeteuea (Gilbert Is.).

Material examined. 1 male; Goréor I.: Ngarekamâis; Jan. 28, 1938 (Murakami).

62. *Thalamitoides tridens typica* (A. Milne-Edwards)

Thalamita (*Thalamitoïdes*) *tridens* A. Milne-Edwards 1869, p. 149, Pl. 6, figs. 1–7—Madagascar (Type-locality).

Material examined.

1 female; Goréor I.: Ngarekamâis; Jan. 28, 1938 (Murakami).

1 female; Toágel Mid (Ngarmid passage); Jan. 29, 1938 (Murakami).

1 male; South of Ngaregól I.: Mar. 25, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

63. *Thalamonyx parvidens* Rathbun

Thalamonyx parvidens Rathbun 1907, p. 62, Pl. 5, fig. 9—Mela [= ?Wela I., Truk] (Caroline Is.).

64. *Scylla serrata* (Forskål)

Scylla serrata Sakai 1936, p. 162—Palau Is.
Scylla serrata Miyake 1938, p. 109—Peliliou Is.

Material examined.

2 specimens; Peliliou I.; Mar. 6, 1936 (Esaki).

1 female; Ponape (Caroline Is.); Dec. 30, 1937 (Esaki).

65. *Podophthalmus vigil* (Fabricius)

Podophthalmus vigil Sakai 1936, p. 163—Palau Is.

Family **Xanthidae** Alcock 1898

66. *Carpilius maculatus* (Linnaeus)

Carpilius maculatus Sakai 1936, p. 163—Palau Is.

67. *Carpilodes bellus* (Dana)

Carpilodes bellus Odhner 1925, p. 16, Pl. 1, fig. 9—Ponape (Caroline Is.). Jaluit, Ebon, Likieb (Marshall Is.). Aranuka, Apemama, Tamana, Arorai (Gilbert Is.).

Material examined.

6 males, 5 females; Kusaie (Caroline Is.); Dec. 20–21, 1937 (Esaki).

2 female; Songél a Lise: Ngasásaker islet; Dec. 22, 1937 (Murakami).

68. *Carpilodes cinctimanus* (White)

Carpilodes cinctimanus Odhner 1925, p. 14—Aranuka (Gilbert Is.).

69. *Carpilodes laevis A.* Milne-Edwards

Carpilodes laevis Odhner 1925, p. 13, Pl. 1, figs. 2–3.

Material examined. 2 males, 1 female; Ngarekobasáng passage; Jan. 5, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

70. *Carpilodes pallidus* Borradaile

Carpilodes pallidus Odhner 1925, p. 20, Pl. 1, fig. 17—Jaluit (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

71. *Carpilodes rugatus* (Latreille)

Carpilodes rugatus Odhner 1925, p. 20, Pl. 1, fig. 16—Aranuka, Apamama, Tamana, Arorai (Gilbert Is.).

72. *Carpilodes semigranosus* (de Man)

Carpilodes semigranosus Odhner 1925, p. 15, Pl. 1, fig. 6—Jaluit (Marshall Is.).

73. *Carpilodes stimpsoni* A. Milne-Edwards

Carpilodes stimpsoni Odhner 1925, p. 17, Pl. 1, fig. 10 –Palau Is., Aranuka (Gilbert Is.).

74. *Carpilodes tristus* Dana

Carpilodes tristus Odhner 1925, p. 12, Pl. 1, fig. 1—Namo, Jaluit, Likieb (Marshall Is.). Makin, Tarawa, Apamama, Aranuka, Tapeteuea, Beru (Gilbert Is.),

75. *Carpilodes venosus* (H. Milne-Edwards)

Carpilius venosus H. Milne-Edwards 1834, p. 383—Locality unknown.
Carpilodes venosus Odhner 1925, p. 22, Pl. 2, fig. 1—Sagami Bay, Japan.

Material examined.

1 male; Toágel Mid (Ngarmid passage); Jan. 29, 1938 (Murakami).
1 male; Goréor Is.: Ngarekamâis; May 26, 1938 (Murakami).
1 male; Ulupságel Is.: Ngaregelngáel; May 29, 1938 (Murakami).
1 male; Songél a Lise.

76. *Neoliomera insularis* (White)

Neoliomera insularis Odhner 1925, p. 32, Pl. 2, fig. 14—New Guinea, Mindanao, Bonin Is.

Material examined. 1 male; Ngurukdápel I.: Malagál harbour; Mar. 23, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

77. *Neoliomera pubescens* (H. Milne-Edwards)

Neolimera pubescens Odhner 1925, p. 28, Pl. 2, figs. 6–7—Palau Is.

78. *Neoliomera richtersi* (de Man)

Neolimera richtersi Odhner 1925, p. 33, Pl. 2, fig. 13—Palau Is.

79. *Lachnopodus subacutus* (Stimpson)

Lachnopodus subacutus Balss 1938, p. 36—Aranuka, Apamama (Gilbert Is.).

80. *Lachnopodus tahitensis* (de Haan)

Lachnopodus tahitensis Balss 1938, p. 36—Apamama (Gilbert Is.).

81. *Atergatis latissimus* (H. Milne-Edwards)

Atergatis latissimus Balss 1938, p. 37—Jaluit (Marshall Is.).

82. *Atergatis ocyroe* (Herbst)

Atergatis floridus Balss 1938, p. 36—Ebon (Marshall Is.).

Material examined. 1 male; Goréor I.: Ngarekamâis; Mar. 29, 1938 (Murakami).

83. *Palatypodia anaglypta* (Heller)

Platypodia anaglypta Sakai 1936, p. 154—Palau Is.
Platypodia anaglypta Balss 1938, p. 37—Beru (Gilbert Is.).

Material examined. 1 female; Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

84. *Platypodia digitalis* Rathbun

Platypodia digitalis Rathbun 1907, p. 38, Pl. 1, fig. 6; Pl. 9, figs. 4, 4 a—Kusaie (Caroline Is.).

85. *Platypodia granulosa* (Rüppell)

Lophoactaea semigranosa Ortmann 1893, p. 459—Palau Is.
Platypodia granulosa Sakai 1936, p. 163, Pl. 14, fig. 2—Palau Is.
Platypodia granulosa Balss 1938, p. 37—Aranuka (Gilbert Is.).

Material examined.

1 male; Truk (Caroline Is.); Jan. 21, 1938 (Esaki).

1 male; Babldáob I.: Ngatmél, Ngegregolóng; Mar. 13, 1938 (Murakami).

86. *Platypodia semigranosa* (Heller)

Platypodia semigranosa Balss 1938, p. 37—Jaluit (Marshall Is.).

87. *Zosimus aeneus* (Linnaeus)

Zosimus aeneus Safford 1905, p. 9—Guam (Mariana Is.).
Zozymus aeneus Balss 1938, p. 38—Ailinglablab (Marshall Is.). Aranuka, Tamana (Gilbert Is.).

Material examined. 1 female; Tokobei I.; Apr. 7–12, 1938 (Murakami).

88. *Zozymodes pumilus* (Jacquinot et Lucas)

Zozymus pumilus Jacquinot et Lucas—Palau Is. [Balss 1922, p. 124].
Xanthodius cristatus Rathbun 1907, p. 41—Ponape (Caroline Is.).
Zoozymodes pumilus Balss 1938, p. 39—Apamama (Gilbert Is.).

Material examined. 1 male, 1 female; Kusaie (Caroline Is.); Dec. 22, 1937 (Esaki).

89. *Lophozozymus pulchellus* A. Milne-Edwards

Lophozozymus pulchellus Balss 1938, p. 40—Jaluit (Marshall Is.). Aranuka, Apamama, Tamana (Gilbert Is.).

90. *Euxanthus exsculptus* (Herbst)

Euxanthus exsculptus Balss 1938, p. 41—Jaluit, Madjeru (Marshall Is.). Aranuka, Apamama, Tamana (Gilbert Is.).

91. *Euxanthus rugosus* Miers

Euxanthus exsculptus var. *rugosus* Miers 1884, p. 527.
Euxanthus rugosus Rathbun 1911, p. 215, Pl. 18, fig. 1.

Material examined. 1 female; Goréor I.: Ngarekamâis; Mar. 29, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

92. *Xantho* (*Leptodius*) *cavipes* (Dana)

Leptodius cavipes Balss 1938, p. 42—Jaluit (Marshall Is.).

93. *Xantho* (*Leptodius*) *crassimanus* A. Milne-Edwards

Xantho crassimanus A. Milne-Edwards 1867, p. 267.

Material examined. 1 male; Kusie (Caroline Is.); Dec. 20, 1937 (Esaki).

Remarks. New to the fauna of Micronesia.

94. *Xantho* (*Leptodius*) *danae* Odhner

Xantho exaratus var. *nudipes* Ortmann 1893, p. 447—Ponape (Caroline Is.).
Xantho danae Balss 1938, p. 41—Jaluit (Marshall Is.). Tapeteuea (Gilbert Is.).

Material examined. 1 female; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

95. *Xantho* (*Leptodius*) *efferens* (Rathbun)

Leptodius efferens Rathbun 1907, p. 39, Pl. 1, fig. 11; Pl. 7, figs. 6, 6 a—Ponape (Caroline Is.).

96. *Xantho* (*Leptodius*) *exaratus* (H. Milne-Edwards)

Leptodius exaratus Parisi 1916, p. 180—Truk (Caroline Is.).
Leptadius exaratus Horii 1916, p. 250—Jaluit (Marshall Is.).
Xantho (*Leptodius*) *exaratus* Balss 1938, p. 41—Jaluit, Likieb (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

97. *Xantho* (*Leptodius*) *gracilis* (Dana)

Leptodius gracilis Rathbun 1907, p. 39—Kusaie (Caroline Is.).
Leptodius gracilis Balss 1938, p. 42—Jaluit (Marshall Is.). Aranuka (Gilbert Is.).

98. *Xantho* (*Leptodius*) *sanguineus* (H. Milne-Edwards)

Xantho exaratus var. *sanguinea* Ortmann 1893, p. 447—Ponape (Caroline Is.).
Xantho exaratus var. *sanguinea* Doflein 1904, p. 407—Jaluit (Marshall Is.).
Leptodius saguineus Rathbun 1907, p. 39—Ponape (Caroline Is.). Aino [Arno?, Marshall Is.]. Tarawa (Gilbert Is.).
Leptodius sanguineus Balss 1938, p. 42—Jaluit, Namrik (Marshall Is.). Aranuka, Nonuti (Gilbert Is.).

Material examined.

5 males; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

3 males; Tokobei I.; Jan. 8, 1938 (Murakami).

2 males, 2 females; Peliliou I.: Ngarageúkl; Jan. 20, 1938 (Murakami).

1 male; Peliliou I.: Ngaregól; Jan. 22, 1938 (Murakami).

1 female; Babldáob I.: Melekéiok; Feb. 4, 1938 (Murakami).

1 male; Ngáruangel Atoll; Feb. 20, 1938 (Murakami).

2 males, 1 female; Ngaiánges I.; Mar. 7, 1938 (Murakami).

99. *Medaeus elegans* A. Milne-Edwards

Medaeus elegans Balss 1938, p. 43—Apamama (Gilbert Is.).

100. *Cycloxanthops cavatus* (Rathbun)

Cycloxanthops cavatus Balss 1938, p. 43—Aranuka, Apamama (Gilbert Is.).

101. *Etisus deflexus* Dana

Etisus deflexus Odhner 1925, p. 84—Aranuka (Gilbert Is.).
Etisus deflexus Sakai 1936, p. 164, text-figs. 5-a–b—Palau Is.

102. *Etisus demani* Odhner

Etisus demani Balss 1938, p. 45—Jaluit (Marshall Is.). Apamama, Nukunau (Gilbert Is.).

103. *Etisus dentatus* (Herbst)

Etisus dentatus Balss 1938, p. 44—Tamana (Gilbert Is.).

104. *Etisus electra* (Herbst)

Etisus electra Balss 1938, p. 44—Jaluit (Marshall Is.). Aranuka, Tapeteuea (Gilbert Is.).

Material examined. 1 male, 1 ovig. female; Ngarekeklau I. Mar. 14, 1938 (Murakami).

105. *Etisus laevimanus* Randall

Etisus laevimanus Sakai 1936, p. 164—Palau Is.
Etisus laevimanus Balss 1938, p. 44—Aranuka, Tapeteuea (Gilbert Is.).

Material examined.

1 male; Songél a Lise: K-division; Dec. 19, 1937 (Murakami).
1 male; Songél a Lise: C-division; Dec. 21, 1937 (Murakami).
1 female; Goréor I.; Feb. 2, 1938 (Esaki).
1 male; Babldáob I.: Melekéiok; Feb. 5, 1938 (Murakami).
2 males; Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

106. *Etisus utilis* Jacquinot et Lucas

Etisus utilis Sakai 1936, p. 166, Pl. 13, fig. 1—Palau Is.

Material examined. 1 male; Goréor I.: Ngarekamâis; Mar. 29, 1938 (Murakami).

107. *Actaea cavipes* Dana

Actaea cavipes Rathbun 1907, p. 44—Taritari (Gilbert Is.).
Actaea cavipes Odhner 1925, p. 68—Ponape (Caroline Is.). Ebon, Jaluit, Ailinglablab (Marshall Is.). Aranuka, Apamama, Nonuti, Tapeteuea, Beru (Gilbert Is.).

Material examined.

1 ovig. female; Goréor I.: S.W. Madalâi, flat reef; May 11, 1938 (Murakami).
1 male; Goréor I.: Ngaláp; May 25, 1938 (Murakami).

107 a. *Actaea cavipes* var. *cellulosa* (Dana)

Actaea cavipes var. *cellulosa* Odhner 1925, p. 69—Likieb (Marshall Is.).

108. *Actaea consobrina* A. Milne-Edwards

Actaea consobrina Odhner 1925, p. 67, Pl. 4, fig. 14—Jaluit (Marshall Is.). Aranuka (Gilbert Is.).

109. *Actaea hirsutissima* (Rüppell)

Actaea hirsutissima Odhner 1925, p. 69, Pl. 4, fig. 13—Ponape (Caroline Is.). Namo, Jaluit (Marshall Is.).

110. *Actaea nobilii* Odhner

Actaea nobilii Odhner 1925, p. 70, Pl. 4, fig. 5—Jaluit (Marshall Is.).

111. *Actaea polyacantha* (Heller)

Actaea polyacantha Odhner 1925, p. 57—Ebon (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

112. *Actaea rufopunctata* (H. Milne-Edwards)

Actaea rufopunctata Odhner 1925, p. 60—Jaluit (Marshall Is.). Makin, Apamama, Aranuka, Tapeteuea (Gilbert Is.).

113. *Actaea ruppelli* (Krauss)

Actaea ruppelli Odhner 1925, p. 45, Pl. 3, fig. 6—Ponape (Caroline Is.). Jaluit, Ebon, Medjeru 2 (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

114. *Actaea ruppellioides* Odhner

Actaea ruppellioides Odhner 1925, p. 47, Pl. 3, fig. 9—Aranuka (Gilbert Is.).

115. *Actaea superciliaris* Odhner

Actaea superciliaris Odhner 1925, p. 49, Pl. 3, fig. 11—Palau Is. (Caroline Is.). Jaluit, Ebon, Medjeru (Marshall Is.). Tarawa, Aranuka, Apamama, Tapeteuea (Gilbert Is.).

116. *Actaea speciosa* (Dana)

Actaea speciosa Odhner 1925, p. 62—Truk (Caroline Is.). Jaluit (Marshall Is.). Tapeteuea, Tamana (Gilbert Is.).

Actaea tomentosa (H. Milne-Edwards)

Actaea tomentosa Rathbun 1907, p. 42—Ponape (Caroline Is.).
——— Horii 1916, p. 250—Jaluit (Marshall Is.).
——— Odhner 1925, p. 70—aNgeaur I., Palau Is. Truk, Ponape (Caroline Is.). Namo, Jaluit, Ebon (Marshall Is.).

Material examined.

1 male, 1 female; Kusaie (Caroline Is.); Dec. 20, 1937 (Esaki).
1 male; Goréor I.: C-division; Dec. 21, 1937 (Murakami).
1 male, 1 female; Tokobei I., Apr. 7–12, 1938 (Murakami).
1 male, 1 female; Ngaruangl Atoll; Feb. 20, 1938 (Murakami).

118. *Actaea tumulosa* Odhner

Actaea tumulosa Odhner 1925, p. 61, Pl. 4, fig. 10—Makin (Gilbert Is.).

119. *Actaea variolosa* Borradaile

Actaea variolosa Odhner 1925, p. 63—Jaluit (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

120. *Liocarpilodes integerrimus* (Dana)

Liocarpilodes integerrimus Balss 1938, p. 47—Aranuka, Tamana (Gilbert Is.).

121. *Xanthias gilbertensis* Balss

Xanthias gilbertensis Balss 1938, p. 38, text-fig. 17—Aranuka, Apamama (Gilbert Is.).

122. *Xanthias lamarckii* (H. Milne-Edwards)

Xanthias lamarckii Balss 1938, p. 50—Jaluit, Likieb, Medjeru (Marshall Is.). Apaiang, Aranuka, Apamama, Beru (Gilbert Is.).

Material examined. 1 female; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

123. *Xanthias punctatus* (H. Milne-Edwards)

Xanthias (*Lioxantho*) *punctatus* Balss 1938, p. 48—Tapeteuea (Gilbert Is.).

124. *Xanthias tetraodon* (Heller)

Xanthias tetraodon Balss 1938, p. 47, Pl. 2, fig. 1—Jaluit (Marshall Is.).

125. *Paraxanthias ponapensis* (Rathbun)

Xanthias ponapensis Rathbun 1907, p. 44, Pl. 7, figs. 5, 5 a—Ponape (Caroline Is.).
Paraxanthias ponapensis Balss 1938, p. 51—Apamama (Gilbert Is.).

126. *Paraxanthias alcocki* (Calman)

Paraxanthias alcocki Balss 1938, p. 50—Aranuka, Tamana (Gilbert Is.).

127. *Paraxanthias notatus* (Dana)

Paraxanthias notatus Balss 1938, p. 51—Jaluit, Likieb (Marshall Is.). Aranuka, Tamana, Arorai (Gilbert Is.).

128. *Chlorodiella barbata* (Borradaile)

Chlorodiella barbata Balss 1938, p. 53—Jaluit (Marshall Is.). Aranuka, Apamama, Tapeteuea (Gilbert Is.).

129. *Chlorodiella laevissima* (Dana)

Chlorodiella laevissima Rathbun 1907, p. 46—Taritari (Gilbert Is.).

Material examined.

2 males, 1 female; Songél a Lise: Ngasasáker I.; Dec. 22, 1937 (Murakami).

1 female; Ngarekeklau I.; Mar. 14, 1938 (Murakami).

130. *Chlorodiella nigra* (Forskål)

Chlorodiella niger Rathbun 1907, p. 46—Kusaie (Caroline Is.). Taritari (Gilbert Is.).

Chlorodiella niger Balss 1938, p. 52—Jaluit (Marshall Is.). Aranuka, Apamama, Tamana, Tapeteuea, Beru, Arorai (Gilbert Is.).

Material examined.

2 females; Goréor I.: A-division; Dec. 17, 1937 (Murakami).

1 female; Goréor I.: D-division; Dec. 18, 1937 (Murakami).

2 females; Goréor I.: K-division; Dec. 19, 1937 (Murakami).

1 male, 4 females; Goréor I.: C-division; Dec. 21, 1937 (Murakami).

4 males, 4 females; Goréor I.: Ngarekamâis; Jan. 28, 1937 (Murakami).

1 male; Babldáob I.: Ngatmél, Negregolóng; Mar. 13, 1938 (Murakami).

1 female; Tokobei I.: Apr. 8, 1938 (Murakami).

1 female; Ngadarák reef; Apr. 21, 1938 (Murakami).

1 male, 2 females; Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

131. *Chlorodiella venusta* (Rathbun)

Chlorodiella venusta Balss 1938, p. 53—Jaluit, Likieb (Marshall Is.). Makin, Taritari, Aranuka, Apamama, Nonuti, Tapeteuea, Beru, Nukunau, Tamana, Arorai (Gilbert Is.).

132. *Phymodius granulatus* Targioni-Tozzetti

Phymodius granulatus Balss 1938, p. 55—Jaluit, Ebon, Likieb (Marshall Is.). Aranuka, Apamama, Tapeteuea (Gilbert Is.).

133. *Phymodius laysani* Rathbun

Phymodius laysani Balss 1938, p. 55—Arorai (Gilbert Is.).

134. *Phymodius monticulosus* (Dana)

Phymodius ungulatus Rathbun 1907, p. 46, Pl. 4, figs. 4, 4 a (see Gordon 1934)—Taritari (Gilbert Is.).

Phymodius monticulosus Gordon 1934, p. 34, text-figs. 17 a, 17 a', 18 a, 19 a—Taritari I. (same specimen as in Rathbun's material).

Material examined.

3 males, 1 female; Songél a Lise: H-division; Mar. 2, 1938 (Murakami).

1 male; Goréor I.: Ngarekamâis; Mar .19, 1938 (Murakami).

2 males, 2 females; Songél a Lise: J-division; Mar. 24, 1938 (Murakami).

1 female; Ngadrák reef; Apr. 21, 1938 (Murakami).

2 females; Goréor I.: Ngarbagéd, flat reef; May 25, 1938 (Murakami).

1 male, 1 female; Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

135. *Phymodius nitidus* (Dana)

Phymodius nitidus Balss 1938, p. 55—Aranuka (Gilbert Is.).

136. *Phymodius ungulatus* (H. Milne-Edwards)

Phymodius ungulatus Rathbun 1907, p. 46—Kusaie (Caroline Is.).

Material examined. 1 male; Tokobei I.; Apr. 8, 1938 (Murakami).

137. *Pilodius flavus* Rathbun

Pilodius flavus Balss 1938, p. 57—Jaluit (Marshall Is.).

138. *Pilodius paumotensis* Rathbun

Pilodius paumotensis Balss 1938, p. 58—Aranuka, Tamana (Gilbert Is.).

139. *Cyclodius ornatus* Dana

Cyclodius ornatus Rathbun 1907, p. 51, Pl. 5, fig. 5; Pl. 7, fig. 8—Taritari (Gilbert Is.).

140. *Chlorodopsis areolata* (H. Milne-Edwards)

Chlorodopsis areolata Balss 1938, p. 62—Ailinglablab (Marshall Is.). Taritari, Aranuka, Apamama, Nukunau, Tamana (Gilbert Is.). Nauru I.

141. *Chlorodopsis melanochira* A. Milne-Edwards

Chlorodopsis melanochira A. Milne-Edwards 1873, p. 228, Pl. 8, fig. 5.

Material examined.

2 males; Songél a Lise: H-division; Mar. 2, 1938 (Murakami).

1 ovig. female; Tokobei I.; Apr. 7–12, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

142. *Chlorodposis palaoensis* Sakai

Chlorodopsis (*Cyclodius*) *palaoensis* Sakai 1936, p. 167, Pl. 13, fig. 2; Pl. 14, fig. 1—Palau Is.

143. *Chlorodopsis pilumnoides* (White)

Chlorodius pilumnoides Adams et White 1848, p. 41, Pl. 9, fig. 3.
Chlorodopis pilumnoides Balss 1938, p. 59, Pl. 1, fig. 4.

Material examined.

2 males, 1 ovig. female; Goréor I.: Ngarekamâis; Jan. 28, 1938 (Murakami).

2 males, 1 ovig. female; Toagel Mid (Ngarmid passage); Jan. 29, 1938 (Murakami).

6 males, 2 females (1 ovig.); Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

Remarks. New to the fauna of Micronesia.

144. *Chlorodopsis pugil* (Dana)

Chlorodopsis pugil Balss 1938, p. 61—Ebon (Marshall Is.). Aranuka, Tapeteuea (Gilbert Is.).

Material examined. 2 males; Songél a Lise: H-division; Mar. 2, 1938 (Murakami).

145. *Daira perlata* (Herbst)

Daira perlata Doflein 1904, p. 407—Jaluit (Marshall Is.).

146. *Cymo andreossyi* (Audouin)

Cymo andreossyi Balss 1938, p. 63—Jaluit (Marshall Is.). Aranuka (Gilbert Is.).

147. *Cymo melanodactylus* (de Hann)

Cymo melanodactylus Rathbun 1907, p. 53—Taritari (Gilbert Is.).
Cymo melanodactylus Balss 1938, p. 63—Aranuka (Gilbert Is.).

Subfamily **Menippinae** Ortmann

148. *Pseudozius caystrus* (Adams et White)

Pseudozius caystrus Doflein 1904, p. 407—Jaluit (Caroline Is.).
Pseudozius caystrus Balss 1938, p. 64—Kwadjelin, Jaluit (Marshall Is.). Aranuka, Apamama (Gilbert Is.).

Material examined.

5 males, 3 females; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

1 male; Peliliou I.: Ngarageúkl; Jan. 13, 1938 (Murakami).

1 female; Goréor I.: E-division; Jan. 18, 1938 (Murakami).

1 female; Ngaiánges I.; Mar. 7, 1838 (Murakami).

2 males, 2 females (1 ovig.); Tokobei I.; Apr. 7–12, 1938 (Murakami).

149. *Pseudozius pacificus* Balss

Pseudozius pacificus Balss 1938, p. 64, Pl. 2, fig. 5—Jaluit (Marshall Is.).

150. *Ozius gutattus* H. Milne-Edwards

Ozius gutattus Sakai 1936, p. 168, Pl. 13, fig. 3—Palau Is.

151. *Ozius hawaiiensis* Rathbun

Ozius hawaiiensis Rathbun 1907, p. 54—Kusaie (Caroline Is.).

152. *Ozius rugulosus* Stimpson

Ozius rugulosus Stimpson 1907, p. 60, Pl. 7, fig. 6—Bonin Is.

Material examined. 1 female; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

153. *Epixanthus corrosus* A. Milne-Edwards

Epixanthus corrosus Balss 1938, p. 66—Jaluit (Marshall Is.).

154. *Lydia annulipes* (A. Milne-Edwards)

Lydia annulipes Balss 1938, p. 66—Jaluit (Marshall Is.).

155. *Lydia tenax* (Rüppell)

Cancer tenax Rüppell 1830, p. 11, Pl. 3, fig. 1; Pl. 6, fig. 5—Red Sea.
Lydia tenax Horii 1916, p. 250—Jaluit (Marshall Is.).

156. *Glabopilumnus actumnoides* (A. Milne-Edwards)

Glabopilumnus actumnoides Balss 1938, p. 66—Aranuka, Apamama, Tamana (Gilbert Is.).

157. *Eriphia laevimana* Latreille

Eriphia laevimana Doflein 1904, p. 407—Jaluit (Marshall Is.).
Eriphia sebana Rathbun 1907, p. 57—Kusaie (Caroline Is.).
Eriphia sebana Horii 1916, p. 250—Jaluit (Marshall Is.).
Eriphia laevimana Sakai 1936, p. 169, Pl. 12, fig. 3—Palau Is.
Eriphia laevimana Balss 1938, p. 66—Jaluit (Marshall Is.). Aranuka (Gilbert Is.).

Material examined. 1 male; Tokobei I.; Apr. 7–12, 1938 (Murakami).

158. *Eriphia scabricula* Dana

Eriphia scabricula Balss 1938, p. 66—Likieb (Marshall Is.). Apaiang, Aranuka, Apamama, Nonuti, Beru, Nukunau, Tamana (Gilbert Is.).

Material examined. 1 male; Tokobei I.; Apr. 7–12, 1938 (Murakami).

159. *Dacryopilumnus eremita* Nobili

Dacryopilumnus eremita Balss 1938, p. 67—Jaluit (Marshall Is.).

160. *Pilumnus andersoni* DE MAN

Pilumnus andersoni RATHBUN 1907, p. 55—Ponape (Caroline Is.).

161. *Pilumnus forskalii coerulescens* A. MILNE-EDWARDS

Pilumnus forskalii coerulescens BALSS 1938, p. 67—Ebon (Marshall Is.). Aranuka, Apamama, Tapeteuea, Beru, Nukunau, Tamana (Gilbert Is.).

162. *Pilumnus cusor* A. MILNE-EDWARDS

Pilumnus cusor BALSS 1938, p. 68—Aranuka, Tamana (Gilbert Is.).

163. *Pilumnus tahitensis* DE MAN

Pilumnus tahitensis BALSS 1938, p. 68—Jaluit (Marshall Is.).

164. *Pilumnus vespertilio* (FABRICIUS)

Pilumnus vespertilio PARISI 1916, p. 183—Truk (Caroline Is.).

Material examined.

1 male; Peliliu I.: Ngarageúkl; Jan. 20, 1938 (MURAKAMI).

1 male; Ngarekeklau I.; Mar. 14, 1938 (MURAKAMI).

1 male; Goréor I.: Ngarekamâis; Mar. 29, 1938 (MURAKAMI).

2 females; Goréor I.: Ngarbagéd; May 27, 1938 (MURAKAMI).

165. *Actumnus asper* (RÜPPELL)

Actumnus asper SAKAI 1936, p. 169—Palau Is.

166. *Planopilumnus vermiculatus* (A. MILNE-EDWARDS)

Planopilumnus vermiculatus BALSS 1938, p. 70—Ebon (Marshall Is.). Aranuka (Gilbert Is.).

167. *Heteropilumnus setosus* (A. MILNE-EDWARDS)

Heteropilumnus setosus BALSS 1938, p. 70—Kwadjelin, Jaluit, Medjeru (Marshall Is.).

Material examined.

1 male, 1 female; Kusaie (Caroline Is.); Dec. 21, 1937 (ESAKI).

1 male; Ngurukdápel I.: Malagal Harbour; Mar. 23, 1938 (MURAKAMI).

168. *Lybia tesselata* (LATREILLE)

Lybia tesselata BALSS 1938, p. 71—Tarawa, Aranuka, Apamama, Beru, Tamana (Gilbert Is.).

169. *Domecia hispida* EYDOUX et SOULEYET

Domecia hispida BALSS 1938, p. 71—Jaluit (Marshall Is.). Apamama, Tapeteuea (Gilbert Is.).

Materiál examined. 2 males, 2 females (1 ovig.); Songél a Lise: H-division; Mar. 2, 1937 (Murakami).

170. *Trapezia cymodoce* (Herbst)

Trapezia cymodoce Doflein 1904, p. 407—Jaluit (Marshall Is.).
Trapezia cymodoce Horii 1916, p. 250—Jaluit.
Trapezia cymodoce Sakai 1936, p. 169—Palau Is.
Trapezia cymodoce Balss 1938, p. 72—Jaluit (Marshall Is.). Aranuka, Apamama, Tapeteuea (Gilbert Is.) .

Material examined.

2 males, 2 ovig. females; Songél a Lise: E-division, on *Stylophora;* Jan. 18, 1938 (Murakami).

1 male, 2 ovig. females; Songél a Lise: G-division; Mar. 22, 1938 (Murakami).

2 males, 1 female; Songél a Lise: J-division; Mar. 25, 1938 (Murakami).

170 a. *Trapezia cymodoce areolata* Dana

Trapezia areolata Ortmann 1893, p. 485—Palau Is.

Material examined. 1 ovig. female; Songél a Lise: J-division; Mar. 28, 1938 (Murakami).

170 b. *Trapezia cymodoce dentata* McLeay

Trapezia cymodoce var. *dentata* Ortmann 1893, p. 483—Palau Is.

171. *Trapezia digitalis* Latreille

Trapezia digitalis 1938, Balss p. 72—Aranuka, Apamama, Tapetenea (Gilbert Is.).

172. *Trapezia ferruginea* Latreille

Trapezia ferruginea Balss 1938, p. 72—Aranuka, Apamama, Tapeteuea (Gilbert Is.). Ebon, Jaluit (Marshall Is.).

173. *Trapezia guttata* Rüppell

Trapezia cymodoce guttata Sakai 1936, p. 170—Palau Is.

Material examined. 2 males, 3 females; Songél a Lise: J-division; Mar. 28, 1938 (Murakami).

174. *Trapezia rufopunctata* (Herbst)

Trapezia rufopunctata Balss 1938, p. 72—Jaluit (Marshall Is.). Apamama (Gilbert Is.).

2 males; Babldáob I.: Melekéiok; Feb. 4, 1938 (Murakami).

1 male; Ngáruangel Atoll; Feb. 20, 1938 (Murakami).

191. *Ocypode urvillei* Guérin

Ocypoda urvillei Doflein 1904, p. 406—Jaluit (Marshall Is.).

192. *Uca annulipes* (Latreille)

Uca annulipes Sakai 1936, p. 170—Palau Is.
Uca annulipes Miyake 1938, p. 109—Saipan (Mariana Is.). Yap I. (Caroline Is.). Babldáob I.

Material examined.

2 males, 1 female; Yap (Caroline Is.); Feb. 15, 1936 (Esaki).

3 males, 3 females; Babldáob I.; Feb. 24, 1936 (Esaki).

1 male, 1 female; Saipan (Mariana Is.); Mar. 22, 1936 (Esaki).

2 males, 4 females; Ponape (Caroline Is.); Jan. 15, 1938 (Esaki).

2 males; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

1 male, 1 female; Babldáob I.; Feb. 4, 1938 (Esaki).

193. *Uca dubia* (Stimpson)

Uca dubia Sakai 1936, p. 170—Palau Is.
Uca dubia Miyake 1938, p. 109—Babldáob I., Palau Is.

Material examined.

1 female; Babldáob I.; Feb. 24, 1936 (Esaki).

3 males, female; Palau Is.; Jan.–July, 1937 (Yamanouchi).

4 males; Goréor I.: Ngarbagéd, mangrove swamp; Apr. 2, 1938 (Murakami).

194. *Uca forcipita* (de Man)

Gelasimus coarctata Ortmann 1894, p. 756—Ponape (Caroline Is.).
Gelasimus forcipatus Ortmann 1894, p. 756—Palau Is.

195. *Uca gaimardi* (H. Milne-Edwards)

Uca gaimardi Rathbun 1907, p. 26—Kusaie (Caroline Is.).

196. *Uca lactea* (de Haan)

Uca lactea Sakai 1936, p. 171—Palau Is.
Uca lactea Miyake 1938, p. 109—Babldáob, I., Palau Is.

Material examined.

1 male; Babldáob I.; Feb. 24, 1936 (Esaki).

4 males; Goréor I.: Narbagéd, mangrove swamp; Apr. 2, 1938 (Murakami).

197. *Uca marionis nitida* Dana

Uca marionus nitidus Sakai 1936, p. 170—Palau Is.

Material examined.

5 males, 2 females; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

7 males, 2 females; Goréor I.: Ngarbagéd, mangrove swamp; Apr. 2, 1938 (Murakami).

198. *Uca novaeguineae* Rathbun

Uca novaeguineae Sakai 1936, p. 171, text-figs. 6 a–c—Palau Is.
Uca novaeguineae Miyake 1938, p. 110—Babldáob I.

Material examined.

1 male, 1 female; Babldáob I.; Feb. 24, 1936 (Esaki).

5 males, 1 female; Palau I.; June–Dec., 1934 (Hiro).

199. *Uca tetragnon* (Herbst)

Uca tetragnon Doflein 1904, p. 406—Jaluit (Marshall Is.).
Uca tetragnum Balss 1938, p. 75—Taritari, Aranuka, Apamama, Nonuti, Beru, Vaitapu (?) (Gilbert Is.).

200. *Macrophthalmus convexus* Stimpson

Macrophthalmus convexus Ortmann 1894, p. 745—Caroline Is.

201. *Macrophthalmus crassipes* H. Milne-Edwards

Macrophthalmus crassipes de Man 1890, p. 90—Caroline Is.
Macrophthalmus crassipes Ortmann 1894, p. 744—Caroline Is.

202. *Macrophthalmus pacificus* Dana

Macrophthalmus pacificus Dana 1852, p. 314, Pl. 19, figs. 4 a–c.

Material examined. 1 female; Palau Is.; Jan.–July, 1937 (Yamanouchi).

Remarks. New to the fauna of Micronesia.

203. *Macrophthalmus telescopicus* (Owen)

Macrophthalmus telescopicus Ortmann 1894, p. 744—Ponape (Caroline Is.).
Macrophthalmus telescopicus Balss 1938, p. 76—Aranuka, Apamama (Gilbert Is.).

204. *Euplax boscii* (Audouin)

Macrophthalmus (Eupalax) bosci Balss 1938, p. 76—Ailinglablab (Marshall Is.). Nauru I. Makin, Taritari, Aranuka, Nukunau (Gilbert Is.).

Material examined. 1 male; Rëgúio passage (Ngargól I.-Ulupságel I.); May 24, 1938 (Murakama).

Family **Grapsidae** Dana 1851

205. *Grapsus grapsus* (Linnaeus)

Grapsus grapsus Ortmann 1894, p. 703—Palau Is.
Grapsus grapsus Doflein 1904, p. 406—Jaluit (Marshall Is.).
Grapsus grapsus Balss 1938, p. 77—Jaluit, Kwadjelin (Marshall Is.). Aranuka, Tapteuea (Gilbert Is.).

Material examined. 1 female; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

205 a. *Grapsus grapsus tenuicrustatus* (Herbst)

Grapsus grapsus tenuicrustatus Safford 1905, p. 90—Guam (Mariana Is.).

206. *Grapsus strigosus* (Herbst)

Grapsus strigosus Horii 1916, p. 250—Jaluit.

207. *Pachygrapsus laevis* Borradaile

Pachygrapsus laevis Balss 1938, p. 48—Jaluit, Kwadjelin (Marshall Is.). Apaiang, Tarawa, Aranuka, Apamama, Nonuti, Tapeteuea (Gilbert Is.). Nauru I.

208. *Pachygrapsus longipes* Rathbun

Pachygrapsus longipes Rathbun 1907, p. 30—Kuaie, Ponape (Caroline Is.).

209. *Pachygrapsus minutus* A. Milne-Edwards

Pachygrapsus minutus Rathbun 1907, p. 30—Ponape (Caroline Is.).
Pachygrapsus minutus Balss 1938, p. 78—Taritari, Apamama, Aranuka, Tapeteuea, Beru (Gilbert Is.). Nauru I.

Material examined.

1 ovig. female; Songél a Lise: Ngasasáker Islet; Dec. 22, 1937 (Murakami).

1 male, 2 ovig. females; Ngaiánges I.; Mar. 7, 1938 (Murakami).

1 male; Songél a Lise: J-division; Mar. 24, 1938 (Murakami).

1 male; Goréor I.: Ngarbagéd; Apr. 2, 1938 (Murakami).

3 males, 1 ovig. female; Tokobei I.; Apr. 7–9, 1938 (Murakami).

210. *Pachygrapsus plicatus* (H. Milne-Edwards)

Pachygrapsus plicatus Doflein 1904, p. 406—Jaluit (Marshall Is.).
Pachygrapsus plicatus Rathbun 1907, p. 29—Kusaie (Caroline Is.).
Pachygrapsus plicatus Balss 1938, p. 78—Makin, Aranuka, Apamama, Tapeteuea, Beru, Tamana (Gilbert Is.).

Material examined.

2 males, 1 female; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

1 male; Songél a Lise: B-division; Mar. 19, 1938 (Murakami).

3 males, 1 ovig. females; Goréor I.: Narbagéd, mangrove sawamp; Mar. 20, 1938 (Murakami).

2 males; Tokobei I.; Apr. 7–12, 1938 (Murakami).

211. *Geograpsus crinipes* Dana

Geograpsus crinipes Doflein 1904, p. 406—Jaluit (Marshall Is.).

Geograpsus crinipes Rathbun 1907, p. 28—Arno (Marshall Is.). Ponape, Kusaie (Caroline Is.).

Geograpsus crinipes Balss 1938, p. 78—Kwadjelin (Marshall Is.). Aranuka (Gilbert Is.).

Material examined. 1 female; Tokobei I.: Apr. 8, 1938 (Murakami).

212. *Geograpsus lividus stormi* de Man

Geograpsus lividus var. *stormi* Rathbun 1907, p. 29—Taritari, Tarawa (Gilbert Is.).

213. *Metopograpsus messor* (Forskål)

Metopograpsus messor Rathbun 1907, p. 29—Kusaie (Caroline Is.). Taritari (Gilbert Is.).

Metopograpsus messor Horii 1916, p. 250—Jaluit (Marshall Is.).

Metopograpsus messor Sakai 1936, p. 172—Palau Is.

214. *Metopograpsus oceanicus* (Jacquinot et Lucas)

Metopograpsus oceanicus Sakai 1936, p. 173, Pl. 14, fig. 3—Palau Is.

Material examined. 1 male; Ponape (Caroline Is.); Jan. 6, 1938 (Esaki).

215. *Pseudograpsus albus* Stimpson

Pseudograpsus albus Balss 1938, p. 79—Jaluit (Marshall Is.).

216. *Metasesarma aubryi* A. Milne-Edwards

Metasesarma aubryi Balss 1938, p. 79—Jaluit (Marshall Is.). Nukunau (Gilbert Is.).

217. *Plagusia speciosa* Dana

Plagusia speciosa Balss 1938, p. 79—Aranuka, Tamana (Gilbert Is.).

218. *Percnon abbreviatum* (Dana)

Percnon abbreviatum Balss 1938, p. 80—Jaluit (Marshall Is.). Aranuka, Apamama, Tamana (Gilbert Is.).

219. *Percnon planissimum* (Herbst)

Acanthopus planissimus Doflein 1904, p. 407—Jaluit (Marshall Is.).
Peronon Senuifrons Horii 1916, p. 250—Jaluit.
Percnon planissimum Balss 1922, p. 156—Jaluit. Gilbert Is.
Percnon planissimum Balss 1938, p. 80—Jaluit, Ailinglablab, Medjeru, Likieb (Marshall Is.). Makin, Aranuka, Apamama, Beru, Nukunau (Gilbert Is.).

Material examined.

6 specimens (juv.); Kusaie (Caroline Is.); Dec. 20–21, 1937 (Esaki).

2 males; Ngaiánges I.; Mar. 7, 1938 (Murakami).

1 male, 1 female; Goréor I.: Ngarekamâis; May 26, 1938 (Murakami).

220. *Helice leachii* Hess

Helice leachi Rathbun 1907, p. 36—Kusaie (Caroline Is.).

Material examined. 1 male; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

221. *Ptycognathus barbatus* (H. Milne-Edwards)

Ptycognathus barbatus Doflein 1904, p. 407—Jaluit (Marshall Is.).

222. *Sesarma* (*Chiromantes*) *bidens* (de Haan)

Sesarma (*Chiromantes*) *bidens* Sakai 1936, p. 173—Palau Is.
Sesarma (*Chiromantes*) *bidens* Miyake 1938, p. 108—Rota (Mariana Is.).

Material examined. 1 male, 1 female; Rota; Feb. 7, 1936 (Esaki).

223. *Sesarma* (*Chiromantes*) *onychophora* de Man

Sesarma (*Chiromantes*) *onychophora* Sakai 1936, p. 173—Palau Is.

224. *Sesarma* (*Holometopus*) *villosa* A. Milne-Edwards

Sesarma (*Holometopus*) *villosum* Rathbun 1907, p. 35—Kusaie (Caroline Is.).

225. *Sesarma* (*Parasesarma*) *carolinensis* Rathbun

Sesarma (*Parasesarma*) *carolinensis* Rathbun 1907, p. 34, Pl. 5, figs. 2, 2 a; Pl. 9, fig. 1—Kusaie (Caroline Is.).

226. *Sesarma* (*Parasesarma*) *impressa* (H. Milne-Edwards)

Sesarma impressa Bürger 1893, p. 620—Palau Is.

227. *Sesarma* (*Parasesarma*) *moluccensis* de Man

Sesarma (*Parasesarma*) *moluccensis* Miyake 1938, p. 109—Saipan (Mariana Is.).

Material examined.

2 males; Saipan; Mar. 22, 1936 (Esaki).

3 males; Kusaie (Caroline Is.); Dec. 16, 1937 (Esaki).

1 female; Kusaie; Dec. 20, 1937 (Esaki).

1 male; 1 ovig. female; Ponape (Caroline Is.); Jan. 10, 1938 (Esaki).

228. *Sesarma* (*Parasesarma*) *plicata* (Latreille)

Sesarma (*Parasesarma*) *plicatum* Rathbun 1907, p. 34—Kusaie (Caroline Is.).

229. *Sesarma* (*Sesarma*) *meinerti* de Man

Sesarma (*Sesarma*) *meinerti* Miyake 1938, p. 108—Saipan (Mariana Is.).

Material examined. 1 female; Saipan (Mariana Is.); Mar. 3, 1936 (Esaki).

230. *Sesarma* (*Sesarma*) *rotundata* Hess

Sesarma oceanica de Man 1889, p. 429, Pl. 10, fig. 9—Ponape (Caroline Is.).
Sesarma oceanica Doflein 1904, p. 406—Jaluit (Marshall Is.).
Sesarma rotundata Doflein 1904, p. 406—Jaluit.
Sasarma (*Sesarma*) *rotundatum* Rathbun 1907, p. 38—Arno (Marshall Is.).

231. *Sarmatium crassum* Dana

Sarmatium sp. Sakai 1936, p. 173, text-figs. 7 a–b.—Palau Is.

Subtribe ***Hapalocarcinidea*** Verrill 1908

Family **Hapalocarcinidae** Calman 1900

232. *Hapalocarcinus marsupialis* Stimpson

Hapalocarcinus marsupialis Stimpson Proc. Boston Soc. Nat. Hist., Vol. 6, 1859, p. 412 (after Rathbun 1906, p. 892).
——— Hiro 1936, p. 234–235—Palau Is.
——— Hiro 1937, p. 137–154, Pls. 4–6—No new record.

Material examined. 1 female; Palau Is.; June–Feb., 1934–35 (Hiro).

233. *Cryptocirus coralliodytes* Heller

Cryptocirus coralliodytes Heller 1861, p. 38, Pl. 2, figs. 33–35—Red Sea.
——— Hiro 1936, p. 234–235—Palau Is.
——— Hiro 1937, p. 137–154, Pls. 4–6—No new record.

Material examined. 2 females; Palau Is.; Jan.–Feb., 1934–35 (Hiro).

Part III.

Table showing the distribution of Micronesian Brachyura

	I. Mariana Islands				II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands				V. Nauru Island	VI. Marshall Islands									VII. Gilbert Islands									
		Saipan	Rota	Guam			Yap	Truk	Ponape	Kusaie		Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Likieb	Medjeru	Arno	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
												Ralik-Group						Ratak-Group														
DROMIIDAE																															
1. *Cryptodromia canaliculata* STIMPSON	—	—	—	—	—	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—	—	—	×	×	—	×	×	×	—	—	×	—
2. *Cryptodromia hilgendorfi* DE MAN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
DYNOMENIDAE																															
3. *Dynomene hispida* DESMAREST	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
4. *Dynomene praedator* A. MILNE-EDWARDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	×	—	—	—	—	—	—
5. *Dynomene spinosa* RATHBUN	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
CALAPPIDAE																															
6. *Calappa hepatica* (LINNAEUS)	—	—	—	—	×	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—	—	×	—	—	×	×	—	—	—	—	—	—
7. *Calappa philargius* (LINNAEUS)	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8. *Matuta banksii* LEACH	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LEUCOSIIDAE																															
9. *Actaeomorpha erosa* MIERS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—

10. *Cryptocnemus aberrans* BALSS	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
11. *Ebaliopsis erosa* (A. MILNE-EDWARDS)	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × × — — — — — —
12. *Leucosia perlata* (DE HAAN)	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
13. *Leucosides whitmeei* (MIERS)	— — — —	—	—	— — × — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
14. *Nucia gelida* RATHBUN	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
15. *Nucia speciosa* DANA	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × — — — — — — —
16. *Orephorus rugosus* STIMPSON	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — × — — × × — — × — — —
MAJIDAE							
17. *Camposcia retusa* LATREILLE	— — — —	—	×	— — — — —	—	— — — — — — × × — —	— — — — — — — — — — — — —
18. *Oncinupus aranea* DE HAAN	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × — — — — — — —
19. *Achaeus* sp.	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — — — — — —
20. *Parazewa bocki* BALSS	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — × — × × — — — — — —
21. *Parazewa palauensis* MIYAKE	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
22. *Pseudomicippe incerta* BALSS	— — — —	—	—	— — — — —	—	— — — — × — — — — —	— — — — — — — — — — — — —
23. *Menaethius monoceros* (LATREILLE)	— — — —	—	—	— — × — —	—	— — — — × — — × — —	— — — — — × × — — — — × ×
24. *Trigonothir obtusirostris* MIERS	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × × — — × × × ×
25. *Trigonothir pyramidatus* (HELLER)	— — — —	—	—	— — — — —	—	— — — — × — — — — —	— — — — — — — — — — — — —
26. *Xenocarcinus depressus* MIERS	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
27. *Xenocarcinus esakii* MIYAKE	— — — —	—	—	— — — — ×	—	— — — — — — — — — —	— — — — — — — — — — — — —
28. *Xenocarcinus truncatifrons* BALSS	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — — — — — —

	I. Mariana Islands				II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands				V. Naura Island	VI. Marshall Islands								VII. Gilbert Islands							
												Ralik-Group						Ratak-Group								
		Saipan	Rota	Guam			Yap	Truk	Ponape	Kusaie		Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Likieb	Medjeru	Arno	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
29. *Tylocarcinus styx* (Herbst)	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—
30. *Tylocarcinus gracilis* Miers	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—
31. *Perinea tumida* Dana	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	×
32. *Hyastenus* sp.	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33. *Hyastenus subinermis* Zehntner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
34. *Hyastenus unciger* Calman	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35. *Cyclax* (*Cyclomaja*) *suborbicularis* Stimpson	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—
36. *Schizophrys aspera* (H. Milne-Edwards)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
37. *Micippa cristata* (Linnaeus)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Micippa cristata granulipes Zehntner	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38. *Micippa philyra* (Herbst)	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—	×	×	—	×	×	—	×	—	—	—
39. *Tiarinia angusta* Dana	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40. *Tiarinia cornigera* (Latreille)	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

PARTHENOPIDAE							
41. *Parthepone* (*Rhinolambrus*) *pelagica* (Rüppell)	— — — —	×	—	— — × — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
ATELECYCLIDAE							
42. *Kraussia integra* (de Haan)	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × — — — — — — —
43. *Kraussia rastripes* Müller	— — — —	×	—	— — — × —	—	— — — — — — — — — —	— — — — — × — — — × × — —
44. *Kraussia rugulosa* (Krauss)	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × × — — × × — —
PORTUNIDAE							
45. *Catoptrus nitidus* A. Milne-Edwards	— — — —	—	—	— — — — —	—	— — — — × — — — — —	— — — — — × × — — — — — —
46. *Carupa tenuipes* Dana	— — — —	—	—	— — — — —	—	— — — — × — — — — —	— — — — — — — — — — — — —
47. *Neptunus* (*Achelous*) *granulatus* (H. Milne-Edwards)	— — — —	×	—	— — × — —	—	— — — — — — — — — —	— — × × — × × — × — — — —
48. *Neptunus* (*Hellenus*) *longispinosus* Dana	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — — — — — —
49. *Neptunus alcocki* Nobili	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — — — — — —
50. *Neptunus pelagicus* (Linnaeus)	— — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
51. *Thalamita admete* (Herbst)	— — — —	—	—	— — × — —	—	— — — × × — — × × —	— — — — — × × × × × × × —
Thalamita admete var. *edwardsii* Borradaile	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — × — — — — × — — — — —
52. *Thalamita bouvieri* Nobili	— — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — — — — — —
53. *Thalamita coeruleipes* Jacquinot et Lucas	— — — —	×	—	× — — — ×	—	— — — — — — — — — —	— — — — — — × — — — × — —

	I. Mariana Islands	Saipan	Rota	Guam	II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands	Yap	Truk	Ponape	Kusaie	V. Nauru Island	VI. Marshall Islands	Ralik-Group	Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Ratak-Group	Likieb	Medjeru	Arno	VII. Gilbert Islands	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
29. *Tylocarcinus styx* (Herbst)	—	—	—	—	—	—	—	—	—	—	—	—	—												—											
30. *Tylocarcinus gracilis* Miers	—	—	—	—	—	—	—	—	—	—	—	—	—												—					×						
31. *Perinea tumida* Dana	—	—	—	—	—	—	—	—	—	—	—	—	—					×							—					×						×
32. *Hyastenus* sp.	—	—	—	—	×	—	—	—	—	—	—	—	—												—											
33. *Hyastenus subinermis* Zehntner	—	—	—	—	—	—	—	—	—	—	—	—	—					×							—											
34. *Hyastenus uncifer* Calman	—	—	—	—	×	—	—	—	—	—	—	—	—												—											
35. *Cyclax* (*Cyclomaja*) *suborbicularis* Stimpson	—	—	—	—	—	—	—	—	—	—	—	—	—					×							—					×						
36. *Schizophrys aspera* (H. Milne-Edwards)	—	—	—	—	—	—	—	—	—	—	—	—	—					×							—					×						
37. *Micippa cristata* (Linnaeus)	—	—	—	—	×	—	—	—	—	—	—	—	—												—											
Micippa cristata granulipes Zehntner	—	—	—	—	×	—	—	—	—	—	—	—	—												—											
38. *Micippa philyra* (Herbst)	—	—	—	—	×	—	—	—	—	—	—	×	—					—	×						—	×	×	—	×	×	—	×	—	×	—	
39. *Tiarinia angusta* Dana	—	—	—	—	×	—	—	—	—	—	—	—	—												—											
40. *Tiarinia cornigera* (Latreille)	—	—	—	—	×	×	—	—	—	—	—	—	—												—											

PARTHENOPIDAE																																			
41. *Parthepone (Rhinolambrus) pelagica* (Rüppell)	—	—	—	—	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ATELECYCLIDAE																																			
42. *Kraussia integra* (de Haan)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
43. *Kraussia rastripes* Müller	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	×	×	—	—
44. *Kraussia rugulosa* (Krauss)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	×	×	—	—
PORTUNIDAE																																			
45. *Catoptrus nitidus* A. Milne-Edwards	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
46. *Carupa tenuipes* Dana	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
47. *Neptunus (Achelous) granulatus* (H. Milne-Edwards)	—	—	—	—	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	×	×	—	×	—	—	—	—	—
48. *Neptunus (Hellenus) longispinosus* Dana	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
49. *Neptunus alcocki* Nobili	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
50. *Neptunus pelagicus* (Linnaeus)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51. *Thalamita admete* (Herbst)	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	×	×	—	—	×	×	—	—	—	—	—	—	×	×	×	×	×	×	×	—
Thalamita admete var. *edwardsii* Borradaile	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—
52. *Thalamita bouvieri* Nobili	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
53. *Thalamita coeruleipes* Jacquinot et Lucas	—	—	—	—	×	—	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	×	—	—

	I. Mariana Islands				II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands				V. Naura Island	VI. Marshall Islands										VII. Gilbert Islands								
		Saipan	Rota	Guam			Yap	Truk	Ponape	Kusaie		Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Likieb	Medjeru	Arno	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
83. *Platypodia anaglypta* (Heller)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—
84. *Platypodia digitalis* Rathbun	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85. *Platypodia granulosa* (Rüppell)	—	—	—	—	×	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
86. *Platypodia semigranulosa* (Heller)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
87. *Zosimus aeneus* (Linnaeus)	—	—	—	×	—	×	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—
88. *Zozymodes pumilus* (Jacquinot et Lucas)	—	—	—	×	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
89. *Lophozozymus pulchellus* A. Milne-Edwards	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
90. *Euxanthus exsculptus* (Herbst)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	×	—	—	—	—	—	×	×	—	—	—	×	—	—
91. *Euxanthus rugosus* Miers	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
92. *Xantho* (*Leptodius*) *cavipes* (Dana)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
93. *Xantho* (*Leptodius*) *crassimanus* A. Milne-Edwards	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

94. *Xantho (Leptodius) danae* ODHNER	— — — — —	—	—	— — — × ×	—	— — — — × — — — — —	— — — — — — — — × — — — —
95. *Xantho (Leptodius) efferens* (RATHBUN)	— — — — —	—	—	— — — × —	—	— — — — — — — — — —	— — — — — — — — — — — — —
96. *Xantho (Leptodius) exaratus* (H. MILNE-EDWARDS)	— — — — —	—	—	— — × — —	—	— — — — × — — × — —	— — — — — × × — — — — — —
97. *Xantho (Leptodius) gracilis* (DANA)	— — — — —	—	—	— — — — ×	—	— — — — × — — — — —	— — — — — — × — — — — — —
98. *Xantho (Leptodius) sanguineus* (H. MILNE-EDWARDS)	— — — — —	×	×	— — — × ×	—	— — — — × × — — — ×	— — — — × — × × — — — — —
99. *Medaeus elegans* A. MILNE-EDWARDS	— — — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × — — — — — — —
100. *Cycloxanthops cavatus* (RATHBUN)	— — — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — × × — — — — — —
101. *Etisus deflexus* DANA	— — — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — — — — — —
102. *Etisus demani* ODHNER	— — — — —	—	—	— — — — —	—	— — — — × — — — — —	— — — — — × — — — × — — —
103. *Etisus dentatus* (HERBST)	— — — — —	—	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — × —
104. *Etisus electra* (HERBST)	— — — — —	×	—	— — — — —	—	— — — — × — — — — —	— — — — — — × — × — — — —
105. *Etisus laevimanus* RANDALL	— — — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — × — × — — — —
106. *Etisus utilis* JACQUINOT et LUCAS	— — — — —	×	—	— — — — —	—	— — — — — — — — — —	— — — — — — — — — — — — —
107. *Actaea cavipes* (DANA)	— — — — —	×	—	— — — × —	—	— — — × × — × — — —	— — × — — × × × × — × — —
Actaea cavipes var. *cellulosa* (DANA)	— — — — —	—	—	— — — — —	—	— — — — — — — × — —	— — — — — — — — — — — — —
108. *Actaea consobrina* A. MILNE-EDWARDS	— — — — —	—	—	— — — — —	—	— — — — × — — — — —	— — — — — — × — — — — — —
109. *Actaea hirsutissima* (RÜPPELL)	— — — — —	—	—	— — — × —	—	— — × — × — — — — —	— — — — — — — — — — — — —

	I. Mariana Islands				II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands					V. Naura Island	VI. Marshall Islands								VII. Gilbert Islands								
														Ralik-Group						Ratak-Group								
		Saipan	Rota	Guam			Yap	Truk	Ponape	Kusaie			Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Likieb	Medjeru	Arno	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
110. *Actaea nobilii* ODHNER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
111. *Actaea polyacantha* (HELLER)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
112. *Actaea rufopunctata* (H. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	×	—	—	—	×	×	×	—	—	—	—	—
113. *Actaea ruppelli* (KRAUSS)	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	×	—	×	—	×	—	×	—	—	—	×	×	—	—	—	—	—	—
114. *Actaea ruppellioides* ODHNER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
115. *Actaea superciliaris* ODHNER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	—	×	—	×	—	—	—	—	×	×	×	×	×	—	—	—	—
116. *Actaea speciosa* (DANA)	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
117. *Actaea tomentosa* (H. MILNE-EDWARDS)	—	—	—	—	×	×	—	×	×	—	—	—	—	×	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
118. *Actaea tumulosa* ODHNER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
119. *Actaea variolosa* BORRADAILE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
120. *Liocarpilodes integerrimus* (DANA)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	×	—	—
121. *Xanthias gilbertensis* BALSS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
122. *Xanthias lamarckii* (H. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	×	—	×	—	×	—	—	—	×	—	×	×	—	—	—	×	—	—

123. *Xanthias punctatus* (H. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—
124. *Xanthias tetradon* (HELLER)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125. *Paraxanthias ponapensis* (RATHBUN)	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
126. *Paraxanthias alcocki* (CALMAN)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	×	—
127. *Paraxanthias notatus* (DANA)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×	—	—	—	—	—	—	—	—	×	—	—	—	—	×	×
128. *Chlorodiella barbata* (BORRADAILE)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	×	—	×	—	—	—	—
129. *Chlorodiella laevissima* (DANA)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
130. *Chlorodiella nigra* (FORSKÅL)	—	—	—	—	×	×	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—	—	—	×	—	—	×	×	—	×	—	×	×	×
131. *Chlorodiella venusta* (RATHBUN)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×	—	—	—	×	×	—	—	×	×	×	×	×	×	×	×
132. *Phymodius granulatus* TARGIONI-TOZZETTI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	×	—	—	—	—	—	—	—	×	×	—	×	—	—	—	—
133. *Phymodius laysani* RATHBUN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×
134. *Phymodius monticulosus* (DANA)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
135. *Phymodius nitidus* (DANA)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
136. *Phymodius ungulatus* (H. MILNE-EDWARDS)	—	—	—	—	—	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
137. *Pilodius flavus* RATHBUN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
138. *Pilodius paumotensis* RATHBUN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	×	—
139. *Cyclodius ornatus* DANA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
140. *Chlorodopsis areolata* (H. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	×	—	—	×	×	—	—	×	—	×	—

	I. Mariana Islands	Saipan	Rota	Guam	II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands	Yap	Truk	Ponape	Kusaie	V. Naura Island	VI. Marshall Islands	Ralik-Group	Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Ratak-Group	Likieb	Medjeru	Arno	VII. Gilbert Islands	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
141. *Chlorodopsis melanochira* A. Milne-Edwards	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
142. *Chlorodopsis palaoensis* Sakai	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
143. *Chlorodopsis plumnoides* (White)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
144. *Chlorodopsis pugil* (Dana)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
145. *Daira perlata* (Herbst)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
146. *Cymo andreossyi* (Audouin)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
147. *Cymo melanodactylus* (de Haan)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
148. *Pseudozius caystrus* (Adams et White)	—	—	—	—	×	—	—	—	—	—	×	—	—	—	×	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
149. *Pseudozius pacificus* Balss	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
150. *Ozius gutattus* H. Milne-Edwards	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
151. *Ozius hawaiiensis* Rathbun	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
152. *Ozius rugulosus* Stimpson	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

153. *Epixanthus corrosus* A. MILNE-EDWARDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
154. *Lydia annulipes* (A. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155. *Lydia tenax* (RÜPPELL)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
156. *Glabopilumnus actumnoides* (A. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	×	—
157. *Eriphia laevimana* LATREILLE	—	—	—	—	×	×	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
158. *Eriphia scabricula* DANA	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	×	—	×	×	×	—	×	×	×	—
159. *Dacryopilumnus eremita* NOBILI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
160. *Pilumnus andersoni* DE MAN	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
161. *Pilumnus forsakalii coerulescens* A. MILNE EDWARDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	×	×	—	×	×	×	×	—
162. *Pilumnus cusor* A. MILNE-EDWARDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	×	—
163. *Pilumnus tahitensis* DE MAN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
164. *Pilumnus vespertilio* (FABRICIUS)	—	—	—	—	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165. *Actumnus asper* (RÜPPELL)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
166. *Planopilumnus vermiculatus* (A. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
167. *Heteropilumnus setosus* (A. MILNE-EDWARDS)	—	—	—	—	×	—	—	—	—	—	×	—	—	×	—	—	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
168. *Lybia tesselata* (LATREILLE)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	—	—	—	×	×	—

	I. Mariana Islands	Saipan	Rota	Guam	II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands	Yap	Truk	Ponape	Kusaie	V. Naura Island	VI. Marshall Islands	Ralik-Group	Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Ratak-Group	Likieb	Medjeru	Arno	VII. Gilbert Islands	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
169. *Domecia hispida* EYDOUX et SOULEYET	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	—	—	×	—	—	—	—
170. *Trapezia cymodoce* (HERBST)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	×	—	×	—	—	—	—
Trapezia cymodoce areolata DANA	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trapezia cymodoce dentata MCLEAY	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
171. *Trapezia digitalis* LATREILLE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
172. *Trapezia ferruginea* LATREILLE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—	×	×	—	×	—	—	—	—
173. *Trapezia guttata* RÜPPELL	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
174. *Trapezia rufopunctata* (HERBST)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
175. *Tetralia glaberrima* (HERBST)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—	×	×	—	×	—	—	—	—
GONEPLACIDAE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	×	—	—	—	—	—	×	×	—	×	—	—	—	—
176. *Litocheira quadrispinosa* ZEHNTNER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	×	—	—	—	—	—	×	×	—	×	—	—	—	—
177. *Typhlocarcinoides crassipes* TESCH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
178. *Typhlocarcinoides piroculatus* (RATHBUN)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—

179. *Hexapus sexpes* (FABRICIUS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
GECARCINIDAE																																			
180. *Cardisoma carnifex* (HERBST)	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
181. *Cardisoma hirtipes* DANA	—	×	—	×	×	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PINNOTHERIDAE																																			
182. *Pinnotheres consors* BÜRGER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
183. *Pinnotheres glaber* BÜRGER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
184. *Pinnotheres glaberrimus* BÜRGER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185. *Pinnotheres laevis* BÜRGER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
186. *Pinnotheres latus* BÜRGER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
187. *Pinnotheres palaensis* BÜRGER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
188. *Pinnotheres* sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
OCYPODIDAE																																			
189. *Ocypode ceratophthalma* (PALLAS)	—	—	—	×	×	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
190. *Ocypode cordimana* DESMAREST	—	—	—	—	×	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
191. *Ocypode urvillei* GUÉRIN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
192. *Uca annulipes* (LATREILLE)	—	×	—	—	×	—	—	×	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
193. *Uca dubia* (STIMPSON)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
194. *Uca forcipita* (DE MAN)	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195. *Uca gaimardi* (H. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

	I. Mariana Islands				II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands				V. Naurn Island	VI. Marshall Islands														VII. Gilbert Islands				
												Ralik-Group								Ratak-Group									
	Saipan	Rota	Guam				Yap	Truk	Ponape	Kusaie		Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Likieb	Medjeru	Arno	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
196. *Uca lactea* (DE HAAN) .	—	—	—		×		—	—	—																						
197. *Uca marionis nitida* (DANA)	—	—	—		×		—	—	—																						
198. *Uca novaeguineae* RATHBUN	—	—	—		×		—	—	—	×																					
199. *Uca tetragnon* (HERBST)	—	—	—				—	—	—						×							×				×					
200. *Macrophthalmus convexus* STIMPSON	—	—	—				×	—	—																						
201. *Macrophthalmus crassipes* H. MILNE-EDWARDS	—	—	—				×	—	—																						
202. *Macrophthalmus pacificus* DANA	—	—	—		×		—	—	—																						
203. *Macrophthalmus telescopicus* (OWEN) . .	—	—	—				—	—	×																	×					
204. *Euplax boscii* (AUDOUIN)	—	—	—		×		—	—	×						×							×				×					
GRAPSIDAE																															
205. *Grapsus grapsus* (LINNAEUS)	—	—	—		×		—	—	—	×					×											×					
Grapsus grapsus tenuicrustatus (HERBST) . .	—	—	×				—	—	—																						
206. *Grapsus strigosus* (HERBST)	—	—	—				—	—	—						×																

207. *Pachygrapsus laevis* BORRADAILE	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	×	—	—	—	—	—	—	—	—	×	×	×	×	×	×	—	—	—	—
208. *Pachygrapsus longipes* RATHBUN	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
209. *Pachygrapsus minutus* A. MILNE-EDWARDS	—	—	—	—	×	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×	×	—	×	—	×	—	—
210. *Pachygrapsus plicatus* (H. MILNE-EDWARDS)	—	—	—	—	×	×	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—	—	×	—	—	—	×	×	—	×	—	×	×	—
211. *Geograpsus crinipes* DANA	—	—	—	—	—	×	—	—	—	×	×	—	—	×	—	—	×	—	—	—	—	×	—	—	—	—	—	—	×	—	—	—	—	—	—
212. *Geograpsus lividus stormi* DE MAN	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—
213. *Metopograpsus messor* (FORSKÅL)	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
214. *Metopograpsus oceanicus* (JACQUINOT et LUCAS	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
215. *Pseudograpsus albus* STIMPSON	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
216. *Metasesarma aubryi* A. MILNE-EDWARDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—
217. *Plagusia speciosa* DANA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	×	—
218. *Percnon abbreviatum* (DANA)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	×	—
219. *Percnon planissimum* (HERBST)	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	×	×	—	—	×	×	—	×	×	—	—	—	×	×	—	—	×	×	—	—
220. *Helice leachii* HESS	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
221. *Ptycognathus barbatus* (H. MILNE-EDWARDS)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
222. *Sesarma (Chiromantes) bidens* (DE HAAN)	—	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
223. *Sesarma (Chiromantes) onychophora* DE MAN	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

	I. Mariana Islands	Saipan	Rota	Guam	II. Palau Islands	III. Tokobei Islands	IV. Caroline Islands	Yap	Truk	Ponape	Kusaie	V. Naura Island	VI. Marshall Islands	Ralik-Group	Kwadjelin	Namo	Ailinglablab	Jaluit	Namrik	Ebon	Ratak-Group	Likieb	Medjeru	Arno	VII. Gilbert Islands	Makin	Taritari	Apaiang	Tarawa	Apamama	Aranuka	Nonuti	Tapeteuea	Nukunau	Beru	Tamana	Arorai
224. *Sesarma* (*Holometopus*) *villosa* A. MILNE-EDWARDS	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225. *Sesarma* (*Parasesarma*) *carolinensis* RATHBUN	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
226. *Sesarma* (*Parasesarma*) *impressa* (H. MILNE-EDWARDS)	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
227. *Sesarma* (*Parasesarma*) *moluccensis* DE MAN	—	×	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
228. *Sesarma* (*Parasesarma*) *plicata* (LATREILLE)	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
229. *Sesarma* (*Sesarma*) *meinerti* DE MAN	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
230. *Sesarma* (*Sesarma*) *rotundata* HESS	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
231. *Sarmatium crassum* DANA	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
HAPALOCARCINIDAE																																				
232. *Hapalocarcinus marsupialis* STIMPSON	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
233. *Cryptocirus coralliodytes* HELLER	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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Explanation of Plates

Plate XII(I)

1. *Thalamita coeuleipes* JACQUINOT et LUCAS. female from Kusaie.
2. *Thalamita integra* DANA. female from Goréor.
3. *Thalamita crenata* LATREILLE. male from Truk.

Plate XIII(II)

1. *Xenocarcinus esakii* MIYAKE sp. nov. female from Kusaie.
2. *Zozymodes pumilus* (JACQUINOT et LUCAS). male from Kusaie.
3. *Cryptodromia canaliculata* STIMPSON. male from Kusaie.
4. *Heteropilumnus stetosus* (A. MILNE-EDWARDS). male from Kusaie.
5. *Pseudozius caystrus* (ADAMS et WHITE). male from Kusaie.
6. *Actaea tomentosa* (H. MILNE-EDWARDS). male from Kusaie.
7. *Etisus laevimanus* RANDALL. female from Goréor.
8. *Xantho* (*Leptodius*) *crassimanus* A. MILNE-EDWARDS. male from Kusaie.
9. *Carpilodes bellus* (DANA). male from Kusaie.

Plate XIV(III)

1. *Xanthias lamarckii* (H. MILNE-EDWARDS). female from Kusaie.
2. *Ozius rugulosus* STIMPSON. female from Kusaie.
3. *Platypodia granulosa* (RÜPPELL). male from Truk.
4. *Xantho* (*Leptodius*) *danae* ODHNER. female from Kusaie.
5. *Xantho* (*Leptodius*) *sanguineus* (H. MILNE-EDWARDS). male from Kusaie.

Plate XV(IV)

1. *Cardisoma hitipes* DANA. female from Saipan.
2. *Cardisoma carnifex* (HERBST). male from Ponape.

Plate XVI(V)

1. *Uca marionis nitida* (DANA), male from Kusaie.
2. *Uca annulipes* (LATREILLE). male from Ponape.
3. *Helice leachii* HESS. male from Kusaie.
4. *Sesarma* (*Parasesarma*) *moluccensis* DE MAN. male from Kusaie.
5. *Scylla serrata* (FORSKÅL). female from Ponape.

Plate XVII(VI)

1. *Grapsus grapsus* (LINNAEUS). female from Kusaie.
2. *Percnon planissimum* (HERBST). male from Goréor.
3. *Pachygrapsus plicatus* (H. MILNE-EDWARDS). male from Kusaie.
4. *Metopograpsus oceanicus* (JAQUINOT et LUCAS)

Classified List of Papers and Reports bearing on Oceanography Published in Japan during 1937-1938 (with Supplement)

(* articles in Japanese)
(§ articles with abstract in foreign language)

Abbreviations for Titles and Periodicals.

Ann. Zool. Jap. ..... Annotations Zoologicae Japonenses.

Bull. Biogeogr. Soc. Jap. ..... Bulletin of the Biogeographical Society of Japan.

Bull. Earthq. ..... Bulletin of the Earthquake Research Institute, Tokyo Imperial University.

Bull. Jap. Soc. Sci. Fisher. ..... Bulletin of the Japanese Society for Scientific Fisheries.

Chikyû ..... The Globe, Kyoto Imperial University (now discontinued).

Geogr. Rev. Jap. ..... Geographical Review of Japan.

Hyd. Bull. ..... Hydrographical Bulletin (Suirô Yôho).

Jap. Jour. Limn. ..... Japanese Journal of Limnology.

Jap. Jour. Zool. ..... Japanese Journal of Zoology.

Jour. Fac. Sci., Hokkaidô Imp. Univ., Ser. VI ..... Journal of the Faculty of Science, Hokkaidô Imperial University, Series VI, Zoology.

Jour. Fish. Cult. Tokyo ..... Journal of Fish Culture, Tokyo.

Jour. Geogr. ..... Journal of Geography.

Jour. Imp. Fisher. Inst. ..... Journal of the Imperial Fisheries Institute.

Jour. Met. Soc. Jap. ..... Journal of the Meteorological Society of Japan (Kisyô Syûsi).

Jour. Nat. Hist. Soc. Tokyo ..... Journal of the Natural History Society of Tokyo.

Jour. Ocean. ..... Journal of Oceanography (Kaiyô Zihô).

Jour. Sci. Hiroshima Univ. ..... Journal of Science of the Hiroshima University.

Mem. Astron. Soc. Jap. ..... Memoirs of the Astronomical Society of Japan.

Mem. Marine Obs. ..... Memoirs of the Imperial Marine Observatory, Kobe.

Nippon Gak. Kyôk. ..... Report of the Japanese Association for the Advancement of Science.

Palao Trop. Biol. Sta. Studies ..... Palao Tropical Biological Station Studies.

Proc. Imp. Acad.	Proceedings of the Imperial Academy.
Rec. Ocean. Wks. Jap.	Records of Oceanographic Works in Japan.
Rep. Hokkaidô Fish. Exp. Sta.	Report of the Hokkaidô Fisheries Experimental Station.
Rep. Inst. Geol. Tôhoku Imp. Univ.	Report of the Institute of Geology and Palaeontology, Tôhoku Imperial University, in Japanese Language.
Rep. Marine Obs.	Report of the Marine Observatory, Kobe(Ihô).
Sci. Rep. Tôhoku Imp. Univ., Ser. 4.	Science Reports of the Tôhoku Imperial University, Series 4, Zoology.
Trans. Biogeogr. Soc. Jap.	Transactions of the Biogeographical Society of Japan.
Trans. Nat. Hist. Soc. Formosa	Transactions of the Natural History Society of Formosa.
Umi to Sora	Sea and Air.
Venus	The Malacological Society of Japan, Kyoto Imperial University.
Zool. Mag.	Zoological Magazine (formerly Dobutugaku Zasshi).

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